The Chemical Age

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Contents

NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Our Key Industries

THE opinions published this week on the present condition of our new key industries represent in the main the manufacturing interest. The manufacturer is, naturally, in favour of all the protection he can secure; for some months, indeed, we have been assured that without an Act of Parliament to prevent or at least very substantially to restrict German chemical competition there will soon be no chemical industry left in this country. The merchant, on the other hand, is by tradition and experience a free trader, and regards all forms of restriction as so many fetters on commerce. Between the two is the consumer, representing the bulk of the nation. He dislikes his choice of purchases restricted, dislikes even more having to pay two shillings to a British dealer for an article a foreign dealer is eager to sell to him for a shilling, but he generally agrees that if protection is really essential to our existence, then we must accept as large a dose of it—as of some unpalatable medicine—as is necessary to keep us alive. In the Key Industries Bill, which is expected to be introduced early in the Session which opened on Tuesday, these three points of view will need to be considered if the national interest is to be effectually served.

The case of the manufacturer comes first. In the matter of dyestuffs it has been recognised that something must be done to make up for our commercial negligence in the past. The fact that the war found us without a dyestuffs industry was not due to lack of capable research or works chemists. It was due to the neglect of British manufacturers to employ them or to commercialise the results of their work. Germany was wiser and more enterprising, and her success was simply the result of energy, foresight, and organisation. In the national interest it has become necessary to make good our deficiency of commercial enterprise in the past. The Dyestuffs Act is the charter the nation has given to the dyestuffs industry, and every argument that justified the grant of such a charter applies with equal force to the other industries—such as scientific glass and fine chemicals—which have been started during the war. It is difficult to know where to stop once the protective principle is adopted, but it is generally understood that the new Bill will at least include the two branches of industry just mentioned. It is not clear yet whether financial assistance is contemplated—such a proposal would no doubt be vigorously debated. The assistance most commonly in mind is the exclusion, under a licensing system, of foreign competitive products, and the continuance of this exclusion for a period long enough to give the newly established industries a fair chance of self-dependence on their merits.

This, we assume, is what the nation is prepared to concede. What, in return, are these industries expected to give to the nation? First, they must recognise that they are being protected, not for their own private profit, but for the national advantage. Unless they serve the latter purpose the primary reason for their existence disappears. Secondly, protection must not be perverted into a refuge or excuse for inefficiency. That is a prime risk in all protective legislation. The temptation is for the protected interest, relying on artificial defences, to believe itself safe and to neglect the inherent conditions of self-preservation. Thirdly, since a protected industry owes its life to the State it must accept some degree of State supervision. In commercial as in church affairs State patronage implies State control. This principle is definitely recognised in the appointment of a Government representative on some of the boards of management. Lastly, the object of protection is to enable young industries to attain self-dependent manhood. It is a form of wet nursing during the period of growth. If at the end of the probationary term they have not made good, they must be content with the fate of the unfit.

As to the merchant class, they have to make some sacrifice like the rest of us for the sake of the nation. The old-established firms of repute, who are essentially British organisations, are, we believe, quite

prepared for this. The difficulty is with the speculative adventurers who floated into the merchanting business on the war tide, who are bound by few, if any, of the old commercial traditions, and who care little whether their trade is British or anti-British so long as it pays. The natural pitfalls of the chemical trade have already accounted for some; the present stagnation and the necessity for unloading speculative stocks may complete the clearance. The true British merchant is of another class. He is the trusted agent of customers in remote markets, who look to him to supply all their needs. His distant client may want a dozen different articles supplied to him in one consignment, and it is the merchant's business to know where these supplies are obtainable and to see to their shipment. The Manchester merchant, linked up as he is with Lancashire industries, will naturally draw upon local resources first, and only when these fail or are deliberately denied will he turn to foreign producers. It is not to the national interest that he should be forced, by the exclusive policy of home producers, to place orders abroad which he would prefer to place at home, and home producers, whose own position is safeguarded by the State, must expect the interests of the State to be recognised in their own selling and distributing arrangements.

Finally, upon the consumer will depend the final result of these protective experiments. Prepared for a time to make sacrifices in the national interest he will naturally demand the fruit of his sacrifice in due time. Put more bluntly, unless the protected industries within a reasonable period bring themselves to a position of equality with foreign rivals, their claim to preferential treatment will cease. For the moment, then, the responsibility for success or failure rests on the manufacturers and their policy. If they aim honestly at promoting first and foremost the national welfare, they will get their recognition and reward. If, on the contrary, they are tempted to exploit national concessions for their private advantage, the rebound will be sure and conclusive. Attention to some of these reflections may save all of us who desire to see the future of our key industries assured from the disappointments of a Pyrrhic victory.

Is Benzol Stripping Profitable?

In last week's issue we dealt in these columns with the recent Petrol Report, and pointed out that little assistance as regards the provision of substitutes must be expected from the gas undertakings now that they are to sell their commodity on a therm basis. It would appear, however, that those who are anxious to see the compulsory stripping of coal gas enforced cannot, or will not, bring themselves to view the economic side of the problem in its true light. The day after the publication of the report *The Times* had an interesting leader on the subject, in which it quite accurately pointed out that gas undertakings are hardly likely to be enthusiastic about extracting a constituent which, volume for volume, is now ten times more valuable than hydrogen. *The Times*, however, was severely taken to task the next day by one of the members of the Standing Committee, who attempted to show that the situation had been inaccurately stated. As a matter of fact, our contemporary was well able to take care of itself, and by means of detailed figures of a technical nature completely proved its point. That the situation is not generally clear, however, is shown by the fact that even acknowledged experts are capable of underestimating the gasworks case, and we note that, in a recent interview, Professor J. W. Cobb states that "a gallon of benzol is commercially worth from 15d. to 18d. as a constituent of the gas." As a matter of fact, this is putting the value of gaseous benzene too low, and, for this reason, we think that the following straightforward consideration of the case will show fairly conclusively that it is far more profitable to sell benzene as a gas than as a liquid.

Whereas pure benzene has a calorific power of 163,000 B.Th.U. per gallon, the crude mixture as recovered from coal gas has an average heating value of 130,000 B.Th.U. per gallon. Accordingly, if a gallon of benzol is considered, this, as gas, represents 1·3 therms. It is now common knowledge that the Board of Trade has sanctioned a price of 15·2d. per therm in the case of the Gas light & Coke Co., the largest undertaking of its kind in the country, so that 1·3 therms at 15·2d. per therm gives practically 1s. 8d. as the value of the benzene in gaseous form. It has to be borne in mind, however, that the case of this undertaking is exceptional, and throughout the country the average price per therm will probably be in the neighbourhood of 18d., which brings up the average value of a gallon of benzol, when retained in the gas, to nearly two shillings. Professor Cobb's figures are, therefore, somewhat short of actual facts. Again, it is argued that crude benzol will now sell for two shillings per gallon, the same as its average value when sold as gas, but, whereas the two shillings is net revenue when gaseous benzene is sold, it has, when the liquid form is dealt in, to have all the costs of recovery deducted from it. The cost of oil-stripping varies very considerably in accordance with the size of the undertaking; and, although in isolated cases it may be possible to effect recovery for 6d. or 7d. per gallon, experience shows that the average cost is much nearer a shilling, particularly as with plant of the kind the item making up interest on capital, wear and tear, and depreciation is normally as high as 18 per cent. It is not very diffi- to see, therefore, that to sell benzol as a liquid produces just about half the revenue which results from selling it as a gas.

Lord Moulton's Services

The distinguished company which attended the luncheon given on Wednesday to Lord Moulton by the Association of British Chemical Manufacturers was in itself an acknowledgment, if no single word had been uttered, of the indebtedness under which he has laid chemical industry in this country by his services during the war, and of the good feeling, almost amounting to affection, which has grown up between him and the leaders of chemical science and industry. Sir William Pearce, M.P., who presided, expressed these feelings in simple and sincere terms, and Lord Moulton as unaffectedly acknowledged the happiness he found in his national work on explosives production, and his gratification at the success which it achieved.

From the purely personal side, it would have been in any case a notable occasion, but, as often happens now, the personal aspect was presently lost in the consideration of questions of vital interest to the future of chemical and other industries in this country. That it should have fallen to Lord Moulton to produce the explosives which saved us in the war and, later, to make a free-trade nation realise the needs of safeguards for the future, is in itself a poignant example of the changes in our habits of thought wrought by the war. For the members of his family, who habitually fail to escape distinction in any field they enter, were mostly known for studies in divinity, literature and pure scholarship, and he himself shared the free-trade traditions of a staunch Liberal stock. It is only a few weeks since he was pleading the claims of a Dyestuffs Act to prevent another form of German invasion, and now he reappears to urge a similar policy in relation to other key industries, started under great stress and difficulty and only needing time and a fair chance to establish themselves permanently. The conversion of such a figure to such a line of policy has produced unconsciously an effect it is difficult to estimate, and though it may fall to more practical minds to see the second measure through, like the first, it is Lord Moulton who will be remembered as the chief influence in bringing the nation round to a new point of view.

The Dyestuffs Committee

THE Board of Trade has at last completed, with the exception of the appointment of a chairman, the Advisory Committee on Imports under the Dyestuffs Act, and the names of the ten members are published on another page. The delay has obviously been caused by the difficulty in selecting the three "independent" members, and even now this strikes us as the weakest section. The one exception is Dr. M. O. Forster, who brings to the duties the highest scientific and technical qualifications, combined with adequate knowledge of commercial practice and public work. It is true, as his recent speech at the Chemical Industry Club dinner showed, that he is wholeheartedly in favour of the protective principle on which the Act is based, but on matters of administration he may be entirely trusted to hold an unbiassed and judicial judgment. The committee might indeed do much worse than accept him as their chairman. Dr. Forster is, however, not the only chemist among the members. Mr. E. V. Evans has high technical qualifications, too, but although he is officially described as "treasurer of the Society of Chemical Industry" it is hardly likely that his occupancy of this financial office explains his inclusion. Mr. Evans's association with the South Metropolitan Gas Co. has given him first-hand knowledge of the manufacture of intermediates, and in company with Mr. Whetmore (British Dyestuffs Corporation), and Mr. Woolcock, M.P. (Association of British Chemical Manufacturers), he sits as a representative of the manufacturing interest. The other members are closely connected with important commercial concerns, and five of them represent specifically the consumers' interests. Pending a permanent appointment, the duties of chairman will remain in the competent hands of Mr. Percy Ashley, of the Board of Trade. The secretaryship falls to Mr. W. Graham, and one could hardly suggest a happier choice, whether from the point of view of technical equipment and training, or of tact and courtesy in the handling of delicate points.

On Trade Combines

THE report of the sub-committee on soap prices, noticed in our last issue, has set people thinking afresh on the dangers that attend the formation of great trusts and combines. From one point of view these huge organisations are matter for pride. They are proof of the immense vigour and capacity possessed by the heads of British industry, and they impress other countries, as the German chemical combines have managed to impress us. It is not the splendid success of these schemes that people grudge; the policy is only questioned when it is found to inflict penalties on the public or restrictions on trade, and to set up monopolist powers which, though, perhaps, unconsciously, may be harshly exercised. It is generally the trader class who mostly complain, the exporters, for example, of dyestuffs or alkali, who cannot obtain British goods for the supply of export markets. But the grievance is not limited to them. The other day Dr. Carpenter, himself the head of a great manufacturing concern, was protesting as vigorously as any merchant against restrictions placed on his export of sulphate of ammonia.

The remedy suggested is that all trade combines should be subject to certain powers of sypervision by the Board of Trade. Frankly, we dislike the idea of official control of industry. Opinion, however, seems to be growing in favour of some more definite form of control, and since Parliament is responsible for appointing committees of inquiry it is under some obligation to carry out, if only as an experiment, its own committee's recommendations.

The Calendar

Feb.		
21	Royal Society of Arts: "Applications of Catalysis to Industrial Chemistry," by Eric R. Rideal. 8.0 p.m.	John Street, Adelphi, London.
21	Royal College of Science Chemical Society: "The Valency of Carbon," by J. Kearns. 4.30 p.m.	Royal College of Science, Dublin.
21 to Mar. 4	British Industries Fair, 1921. 10 a.m.–6 p.m.	White City, Shepherds Bush, London.
22	The Sheffield Association of Metallurgists and Metallurgical Chemists: "The Sampling of Raw Materials," by B. W. Methley. 7.30 p.m.	Royal Victoria Hotel, Sheffield.
22	Society of Chemical Industry: Glasgow Section.	Technical College, Glasgow.
22	Institution of Petroleum Technologists.	
23	Society of Chemical Industry: Nottingham Section. 7 p.m.	University College, Nottingham.
23	Society of Chemical Industry (Newcastle Section): "Lubrication and Lubricants," by Emil Hatschek. 7.30 p.m.	Armstrong College, Newcastle-on-Tyne.

The Future of our Key Industries

Opinions of Representative British Manufacturers

In view of the prospect of the early introduction of a Key Industries Bill, to include fine chemicals and chemical and scientific glass, we have obtained the following opinions from the heads of British manufacturing firms on the present situation of these and other industries. It will be seen that, generally, the case for some form of protection for these industries is in principle identical with that for the exclusion except under licence of foreign competitive dyestuffs, and that the remedy suggested is also the same.

Mr. T. Lester Swain

(The British Chemical Ware Manufacturers' Association, Ltd.)

SPEAKING for the chemical and scientific glass manufacturers of this country I consider that a period of protection is not only desirable, but is absolutely essential if the manufacture of this vitally important glass is to be continued. Before the war, it will be remembered, our requirements of chemical, scientific and optical glass were met by the production of German and Austrian manufacturers. Consequently, when war broke out our supplies were immediately cut off. The Government then appealed to the British Glass Trade for their assistance in solving the problem of obtaining supplies of chemical and optical glass, which were so essential for war purposes.

The manufacturers have devoted their efforts to the production of these goods, and after a time they had made such progress that the quality of British made chemical glassware was quite the best obtainable in the world. The only direction in which further improvement could possibly have been made was in workmanship, but this is not to be wondered at, as there was a great dearth in this country of skilled labour. The skilled men were quickly absorbed into the combatant services, and the only labour available was entirely untrained in this branch of the industry, consisting for the greater part of youths under military age. When these youths had received a certain amount of training and were on the way to becoming efficient workers they were drafted into the army, and were replaced by another group of untrained workers. Under these conditions it is wonderful that the industry should have made the great progress it did. Although good workmanship was desirable, it will be generally conceded that the quality of the glass was of supreme importance, and the fact that British manufacturers were able, under such adverse conditions, to produce chemical glassware which was unrivalled for quality, says much for their resource and perseverance.

After the armistice the quality of the workmanship was greatly improved; and now it can safely be asserted that British-made chemical and optical glass can compete with any produced elsewhere.

Having brought the manufacturing side to such a high state of perfection, Germany is being allowed to dump her goods here at prices considerably below our cost of manufacture, and the demand for the British article has fallen off to such an extent as to necessitate the discharge of about 50 per cent. of the workers engaged in the chemical glass industry; all this at a time when manufacturers might be extending their plant, increasing their staffs and taking their place in the world's markets. The two factors contributing to this state of affairs are the deflated value of the German mark and the German determination to kill the industry in this country and so regain her pre-war monopoly.

Germany fully realises the importance of the chemical glassware industry, as she also realises that if the industry is forced out of this country now, we shall have no source of supply at hand in case of a future war, for it may safely be assumed that British manufacturers will not devote their capital, brains and initiative as they did in the last war, knowing, as they would, that as soon as the war had finished they would hand the industry back again to Germany.

I am not speaking lightly when I say that the Government must protect the British chemical and optical glass industry or manufacturers must certainly close down altogether; unless definite action is taken within the next three months the industry in this country will be dead.

Dr. Henry Dreyfus

(British Cellulose and Chemical Manufacturing Co., Ltd.)

When the vital importance of aerial warfare came to be appreciated by the Government during the last war it was found that cellulose acetate dope, a product which was vital for the successful development of aviation, was practically unknown in this country, and had certainly never been produced here in pre-war days. As a matter of fact there were, at that time, only two possible sources of supply in the world, and in July, 1915, when the Aeronautical Contracts branch offered a contract for the supply of this essential product, my brother, Dr. Camille Dreyfus, on behalf of the chief producers, the Cellonite Company of Basle, Switzerland, submitted the only tender.

Great Britain was also entirely dependent upon overseas markets for supplies of the necessary solvents of cellulose acetate and during the early days of the war there was an acute shortage of acetic acid and acetone, the two vital constituents of cellulose acetate and dope. In April, 1917, this shortage had become so serious that the British Cellulose Company suggested the use of methyl acetate as an alternative solvent for dope, and in June the Company undertook to supply these solvents in large quantities.

Realising at long last that England must be self-contained and in no way dependent on supplies from overseas, the Ministry of Munitions asked the Company to put down a power plant for the manufacture of acetone, acetic acid and methyl acetate. As all these products are manufactured from carbide of calcium, which, incidentally, was not manufactured here before the war, it will readily be appreciated that this industry is exceedingly important and may be described as a key industry to a key industry.

The erection of plants for the production of these chemicals involved an outlay of £1,500,000 in addition to the cellulose acetate plant which cost over £1,000,000. It was only the existence of these works that made Great Britain independent of overseas supplies which the U-boats menace had rendered so precarious. I am firmly convinced that, in the event of a future war, the need for home production of all war material will be even more essential than it has been in the past as submarines will have been brought to such a state of perfection that they will prevent the carriage of supplies by sea.

The need for encouraging the manufacture of these chemicals in the British Isles, both for purposes of war and of peace, must be apparent to all who have the national welfare at heart, but how is this industry to be encouraged? Certainly not by allowing Germany a free hand in the extermination of the industry by the insidious dumping methods for which she is well known.

If we were in a position so to do, would Germany allow us to adopt a similar policy of dumping? Not for a moment; as soon as she saw what was happening, importations would immediately be prohibited. For proof of this let us take a current instance; Austria, with an exchange still more depleted than that of Germany, recently began dumping carbide into Germany at less than the German cost of production. This was not allowed to go on; the German Government immediately prohibited the importation of carbide, thus saving the situation from the German point of view.

For many years past the German Government has co-operated with the manufacturer in every way possible, instructing him to export his goods at less than the cost of production, thus eventually closing down that industry in the country to which the goods were exported. The profit which the manufacturer had apparently foregone was repaid to him secretly by the Government, and so the destruction of all foreign manufacture progressed merrily. Having successfully

accomplished this object, up went their prices with a bound, as there was no longer any competition to fear.

With the prospect of a continuation and probable development of these tactics and the depleted state of the German exchange which allows the Germans to pay the equivalent of 1s. 4d. in labour for what costs us 15s., the British manufacturer wants some definite assurance, expressed in terms which cannot possibly be misconstrued, that he may count on the assistance of the Government in placing the key, or vital, industries of this country on a firm and proper basis, both for commercial and war purposes.

In the event of a future war we shall have to rely still more upon chemicals and shall envisage war in terms of chemists and laboratories, rather than regiments and guns. If we have in this country a firmly established chemical industry devoted to the production of commercial needs, we can, if the necessity arises, immediately turn our whole resources to the production of war material.

With a flourishing chemical industry unemployment will be reduced, and the prosperity of this country will be correspondingly increased, but if the authorities decline to give their assistance in fostering the industry we shall find before very long that we have reverted to our former dependent condition. The Key Industries Bill is the complement to the Dyestuffs Act, and the arguments advanced in favour of one measure are equally strong in the case of the other.

Sir Edward Brotherton

(Brotherton & Co., Ltd., Leeds.)

Shortly after the outbreak of war it became apparent that we had for some considerable time been relying upon Germany for chemical substances which were essential to our great industries. We also relied upon her for the fine chemicals which were daily prescribed by our physicians. In a word, Germany had, by steady persistence in pure scientific and industrial research, acquired a monopoly in the manufacture of complex chemical substances in bulk.

British chemical manufacturers achieved wonders throughout the war in the improvisation of plant for the manufacture of these essential chemicals; but the greater part of their scientific resources and their personal energies were devoted to the production of explosives and other chemical substances directly used in defeating the enemy. They have not yet had an opportunity of setting their new and delicate processes upon an economic basis, and all they desire is time in which to do so.

It would be a national calamity if monopoly in the manufacture of fine chemicals reverted to Germany, and it would be a calamity of even greater magnitude if the manufacture of chemicals upon which our great industries depend were lost to us. One such substance is osdium hydrosulphate, essential to the manufacture of salvarsan, and used in the dyeing of indigo, the refining of sugar, and the bleaching of wool, silk, straw, oils, soap, clay.

Such young industries should be preserved. They are vital to our national welfare, and we should give them adequate protection until they are firmly established and can resist the fierce competition which may be expected from our former enemies.

Mr. E. Bernard Cook

(Johnson & Sons, Manufacturing Chemists, Ltd.)

The manufacture from coal tar intermediates of the fine chemicals which are used in photography is a new industry for England.

Up to the outbreak of war this country was solely dependent upon foreign manufacture for her supplies of these chemicals, which were important not only to the photographic profession and industry but to innumerable trades, and to technical and scientific purposes of undoubted national importance. The manufacture established to meet with the dire need of the country at war must be assured in the days of peace, for chemistry and science are the very source of industry and progress.

We are convinced that under ordinary competitive conditions, such as obtained before the war, we are economically capable of holding our own against German or any other competition, but until the world's exchange rates are levelled up it is absolutely essential that we should be safeguarded against *unfair* competition. If the shilling and the mark were of approximately the same value, we should have no cause to fear competition, but with the mark valued at something like 1d. the unfairness of the position is obvious. Take the case of the German manufacturer of fine chemicals; if, say, his present costs are six times his pre-war costs, he is at present able to make a handsome profit and to sell his goods in England at below *our* pre-war cost.

The establishment of some definite rate of exchange between the countries of Europe would help to solve the problem of our foreign trade, but failing that, some scheme placing restrictions—not total prohibition—on the importation of certain articles during a certain period is essential if the English fine chemical industry is to be preserved.

During the war we supplied large quantities of photographic chemicals to the Government for the use of the various services, and more especially for the Air Service, and for the Army Medical Department of the War Office for the development of X-ray plates. The demand for photographic chemicals became so heavy that, in order to cope with the demand, we had to develop our manufacturing facilities, and equipped a large works at Hendon, where photographic fine chemicals were manufactured in quantities sufficient to meet all demands. During and since the war we have constantly been making improvements in our methods of manufacture, and have ruthlessly scrapped all temporary plant in order that the progress made during the war should prove of real value to the post-war trade of the country. If, however, foreign photographic chemicals continued to be dumped in this country at a price below our pre-war cost there would be no alternative for us but to close down. Supposing for a moment that we decided to abandon the manufacturing side of the business, and became factors of German synthetic fine chemicals; "If you do," some people would say, "we shall then be able to buy in the cheapest market, for, allowing you a profit on the transaction, we shall still get a cheaper article than you were able to supply us with." Granted, but what is going to happen if we do stop manufacturing? We shall close down our works, thereby throwing many men out of employment, and if other manufacturers do likewise the unemployment question of the moment will sink into oblivion in comparison with the new crisis. The purchasing power of the community will be tremendously depleted, and it is doubtful whether imported goods, however cheap, will find a sale, because there will be no money to purchase them with. If the manufacture of fine chemicals were to cease, such a position as outlined would inevitably follow, for without manufactures employment would be only for a few and not for the many. The strength of England is in manufacture, and there is no real industry without manufacture; at any time some industry may be rendered helpless if it is entirely dependent upon some manufactured article which has to be imported. It is quite certain that if English manufacturers are given the chance, the fine chemical industry, instead of being closed up, will be able to hold its own, not only in the Home markets, but in the markets of the world.

Reverting to the question of exchanges, it is now apparent to many that Germany is only too glad to see the present difference in values. She is able to sell her chemicals at extremely low rates, when she could quite easily demand higher rates, and bring the mark towards parity.

Why should she throw away the riches of her natural resources in chemical products? The obvious reason is that she is anxious to appear poor and evade her liabilities, while, by selling her chemical products at cut rates, she is re-establishing her trade at our expense. Germany sees after the war that industries which were once entirely hers have been established elsewhere, and she is determined, if allowed, to close them down. Surely England will not allow her industries to be closed when her strength in days to come, whether at peace or at war, is in her production and manufacture!

Fine Chemical Industry

Statement by the Association of British Chemical Manufacturers

The Association of British Chemical Manufacturers has issued the following statement on the position of the British fine chemical industry:—

"The next month or so will decide whether in the years to come Great Britain is to make fine chemicals for all the

world, or whether we and the other nations are once more to turn to Germany for our laboratory and photographic chemicals—for essential drugs like antipyrin, phenacetin, cocaine salicylates, aspirin, and salvarsan. The position to-day may be simply stated. During the war there were assembled from our colleges and universities men who, after much striving and many failures, did arduously acquire not only a knowledge of the explosives which destroy life, but of certain drugs—such as phenacetin, salicylates, and salvarsan—that save it. The plant which was then erected was emergency plant, the methods were emergency methods, and, in the circumstances, naturally expensive.

"The manufacture of research chemicals, of photographic chemicals, of synthetic perfumes and essences, is each on the verge of commercial success. The manufacture of drugs has made immense strides. Many, begun some time ago, have been brought to perfection; others had been added, or were being added, when the decision of Mr. Justice Sankey was dropped like a bomb into the thick of this progress. British manufacturers had proved that they could make fine chemicals as good as the fine chemicals of Germany, and they were slowly but quite surely bringing down the cost of making them when the Order in Council prohibiting the importation of drugs was swept aside.

"Unless British firms be given a breathing-space to prepare for competition on fair terms, the collapse of the fine-chemical industry appears to be unmistakably in sight. Many firms are at this moment clinging to the hope that the Key Industries Bill, which has been promised as the first Government measure of the new session, will even yet permit our country to become eventually the source of the world's fine-chemical supply. Just as the making of fine chemicals is the complement to the making of dyestuffs, so is this Bill a pendant of the Dyestuffs Act, already approved by an overwhelming majority of the House of Commons. There does not, indeed, appear to be any weighty reason why we should send to other countries our coal tar, and other by-products from the manufacture of dyes, to be made into chemicals by foreign labour in foreign plant erected by foreign capital. The only class amongst us who would benefit would be the handful of brokers, who would get their commission out of selling over again such of these by-products as came back to us in their manufactured state.

"On the other hand, the national advantages of a flourishing industry such as this will be apparent. Clearly, it would reduce unemployment, and add to the taxable income of the country, and the rateable value of many cities. Excluding coal mining, the fine-chemical industry yields the highest net value of output per head, and it employs the greatest proportion of salaried workers. One may no more set a limit to the future of this industry than to its effect upon sister industries."

The Gas Mantle Industry

On behalf of the gas mantle and subsidiary industries, the Incandescent Mantle Manufacturers' Association have presented a statement supporting their case for inclusion in the Key Industries Bill to the Board of Trade.

The memorandum states that the gas mantle industry bases its claims upon the following considerations :—

1. Both in time of peace and in time of war incandescent gas lighting is necessary for the adequate illumination of docks, railways, factories, &c. (2) It is estimated that 32 million tons more coal would be required yearly to produce the same illumination if flat-flame burners were used instead of gas mantles. (3) The "stripping" of coal gas has been found necessary to ensure adequate supplies of benzol, toluol, and other hydro-carbons for the manufacture of dyes, drugs and explosives; such "stripped" gas can only be used as an illuminant in conjunction with the gas mantle.

Before the war the rare-earth chemicals and the gas-mantle industry were mainly under foreign domination. The total output of Indian monazite sand went to Germany, and British mantle-makers had to purchase thorium nitrate abroad at a price fixed by the Thorium Convention, a combine of German and Austrian manufacturers, controlled by the chief German maker of gas mantles.

In consequence of foreign domination, the home industry became very precarious; nearly all the factories were running at a loss, wages were low, and employment uncertain and unsatisfactory. Hence at the outbreak of war there was insufficient plant to meet the country's requirements, supplies of thorium nitrate were cut off, and there was a shortage of clay rings and other materials required by the industry. To overcome these difficulties, the Indian monazite deposits were placed under British control, and five home manufacturers took up the preparation of thorium nitrate, although until the factories were ready the nitrate had to be purchased abroad at arbitrary prices, which showed large profits to foreign suppliers. These factories can now produce all the gas mantles the country requires; and during the war they supplied the cerium fluoride and cerium oxalate needed for searchlights and tracer bullets. Prior to the war all the mantle rings required by the home industry were either imported from Germany or supplied by a German-owned company with branch works in this country. These works were purchased by a group of the chief British mantle-makers, and so extended that they are now able to meet the country's requirements, although not yet in a position to produce the full range of designs which were offered by the Germans. Ramie yarn, which was also derived from Germany before the war, can now be supplied by British spinning plants in sufficient quantity to meet all requirements.

In conclusion, it is submitted that the manufacture of thorium and rare-earth salts, incandescent mantles, and clay rings be recognised and assisted as "key" industries; that legislation be introduced forthwith to protect the British worker against unemployment resulting from foreign competition; and that the British manufacturers who have responded to appeals to lay the foundations of a self-supporting industry be assured a market free from unfair competition.

Chemical Employees' Petition

As the outcome of a works meeting at which the facts concerning the fine chemical industry in Great Britain were put before the employees by Dr. Jowett, the works manager, a petition in support of the proposed Key Industries' Bill, signed by 648 employees at the Wellcome Chemical Works, Dartford, is being presented to the Prime Minister, the President of the Board of Trade, and to the M.P.'s for Dartford, Gravesend and Chislehurst.

In it they state that, having fully considered and discussed the proposed Bill, they are satisfied that in the best interests of the nation it should pass into law. As employees engaged in the manufacture of fine chemicals, they are specially interested in this object of founding the industry in this country, and as it affects their interests in the most vital manner they request those to whom the petition is addressed to give the Bill their most hearty support.

A Calcium Tungstate Plate for Radiography

AT the monthly meeting of the Scientific and Technical Group of the Royal Photographic Society on February 8th, a paper was read by Dr. Leonard Levy and Mr. T. Thorne Baker on the subject of high-speed radiography, with special reference to the new X-ray plate which has lately been introduced with the object of shortening exposures to one-thirtieth or even one-fortieth of those normally given. Mr. Thorne Baker said that the plate was coated with a silver bromide emulsion, and over this was placed a layer of tungstate of calcium, the same material as is used for intensifying-screens which have been used separately from the plate. In this case the screen was embodied in the emulsion itself. When the calcium tungstate was in optical contact with the silver bromide the exposure was reduced as stated, thanks to the fluorescence of this new medium. The calcium tungstate, so to speak, translated the X-rays into rays of far greater wave-length which had a far greater actinic value. A peculiar feature of the plates thus coated was their extreme sensitiveness to ultra-violet rays, a property which had not many practical applications at present, but which might have at any time. The new plate was likely to be of use, not only in medicine and surgery, but in metallurgy, where the necessary exposures for penetrating thicknesses of metal would be correspondingly reduced.

The Refractometer in Scientific and Technical Work

By Percival J. Fryer, F.I.C.

THE principle underlying the use of the refractometer in scientific and technical work is that substances of different chemical constitution refract light to a different degree, and the measure of this power of refraction, which is termed the *refractive index*, is constant for every pure substance under standard conditions of temperature and pressure.

Its great utility, both for analytical control and in technical works' practice, lies in the fact that owing to the present high degree of perfection in optical instruments, accurate determinations of the refractive power of substances can be made with great ease and rapidity.

In the most convenient types of instrument a single drop only of the substance is required for the examination, and the figure is directly ascertainable after one adjustment of the instrument and a direct reading of the scale. Thus the tedium of weighing or measuring is altogether avoided, and the possibility of errors, due to manipulation, is practically eliminated.

In a previous issue (March 27, 1920) the writer called attention to a most useful and novel application of the refractometer in the control of manufactured products, which consisted of mixtures of liquids or solutions, it being possible in such cases to ascertain whether the mixing of such products had been efficiently carried out.

With regard to the analytical control of various chemical substances there appears to be practically no limit to the application of the refractometer. In many instances the refractive index is displacing the specific gravity, and many other physical and chemical methods, owing to the greater accuracy and utility of the figure obtained.

There are quite a number of refractometers in use for various purposes. Thus, one of the latest and most accurate types is that known as the "Pulfrich" instrument, formerly manufactured exclusively by the firm of Carl Zeiss, of Jena. Very excellent models both of this instrument and that of the Abbé refractometer, referred to below, are now produced by the English firm of Messrs. Adam Hilger. The "Pulfrich" instrument is probably the most suitable one for purely scientific and research work.

For oils and fats analysis it has long been customary to use a simpler form of instrument, termed the "Butyro" refractometer, in which direct readings are made on an engraved scale introduced into the eye-piece, and read at a single observation. So popular has the use of this instrument become, that refractive index readings for oils and fats are generally expressed in the scale numbers of this instrument. It is, however, equally convenient to use any other type of refractometer and to convert such readings into the scale readings of Butyro instrument if desired. Reference scales for this purpose are given in the author's handbook on "Oils, Fats and Waxes," Vol. II., page 52.

The general manipulation of the Butyro refractometer is practically identical with that of the instrument next to be described, with the exception that the reading is directly obtained by observing the position of the dividing light on the eye-piece scale.

The most useful all-round instrument for analytical and technical work is undoubtedly the type known as the Abbé refractometer. As mentioned above, the reading may be converted into the other scale if desired. With this instrument measures of the refractive index may be made between 1·3 and 1·7, thus including the great majority of commonly occurring fluids. An accuracy of one unit in the fourth decimal place is readily attainable, but for this purpose it is absolutely essential to pay great attention to temperature. Either a definite constant temperature must be obtained in the instrument, by passing water through the prisms, or the observation must be made at the temperature of the room, and a correction applied in order to express the results in terms of the standard temperature. In oils and fats determinations and in a great deal of other work, the temperature of 40°C. has been fixed as a convenient standard. The instrument consists essentially of two prisms of dense flint glass, which are mounted in water jackets, and which can be clamped so as to bring two of their faces into contact; between these is placed the liquid under observation, and light is reflected through the combination, the emergent ray being then examined through a telescope.

On applying the eye to the instrument the field of view, which is circular, is seen to be divided into a light and a dark portion, and the boundary line between these is adjusted by turning the lever arm so that it cuts the intersection point of two cross lines which are clearly seen from the eye-piece. In order to eliminate the coloured fringe, which usually appears at the boundary line, special compensating prisms are provided, which are turned by means of a mill-head on the instrument, and which serve to render the dividing line perfectly distinct and free from colour. The reading of the index is then directly made by reference to a divided arc provided on the left-hand, and a magnifier is used to ascertain the fourth decimal place.

THE ABBÉ REFRACTOMETER.

It is very necessary to see that all parts of the prisms are perfectly clean and that there are no air bubbles enclosed between the prism faces. In either of these cases the dividing line is rendered indistinct and accurate observation is impossible. It is not necessary to use any special form of artificial light for the reading of this instrument, which is a great convenience.

Of other types of instrument which have been proposed from time to time, the differential refractometer designed by Amagat and Jean is of great interest, and still enjoys a certain vogue. It is, however, beyond question preferable to make observations under standard conditions and in absolute terms, so that comparisons may be made with other determinations under similar conditions, which is not possible with the differential type of instrument.

Dr. J. C. Cain: An Appreciation

By a Colleague

WITHOUT untrammelled intercourse between their exponents both science and industry must remain limited in development. Whilst this country has not failed to produce great men of science and successful pioneers of industry, the function of interpreting the one type to the other has been fulfilled by comparatively unnoticed agents. It was the assiduous performance of such service which presented the distinguishing feature of Dr. Cain's career. He was at home equally in the factory, the laboratory, the study, and the lecture-theatre. His approach to a problem was one of ordered inquiry, and therefore scientific, while his method of transmitting the results to a commercial associate was human and intelligible. His faults were so transparent and superficial as to be quickly dismissed from all but the meanest minds, whilst his qualities were such as to secure the respect of numerous distant colleagues, and the warm affection of those with whom he worked in close intimacy.

John Cannell Cain was born at Edenfield, near Manchester, on September 28, 1871, being the eldest son of the Rev. Thomas Cain, who survives him. His early scientific training was received at Owens College, where he graduated B.Sc. in 1892; on completing the doctorate at Tübingen he proceeded to Heidelburg in the autumn of 1893, and after revisiting Owens for a few months he joined the staff of Messrs. Levinstein in 1895. Remaining with this firm until 1901, he consolidated his taste for the organic branch of the subject, and laid the foundation of that whole-hearted interest in colour-chemistry, practical and theoretical, which launched him on the course he was destined to pursue through life.

These early years, and the associations he formed therein, gave the guiding principle to his future activities, resembling the operations of a loom in which the basic theories of colour chemistry were constantly interwoven with practical applications. An interval of teaching at the Municipal Technical School, Bury, where he served as head of the Chemistry and Physics Department from 1901 to 1904, increased his capacity to arrange a subject for presentation and gave him the opportunity to investigate, in conjunction with Mr. F. Nicoll, the rate of decomposition undergone by solutions of diazonium salts. In the following year, collaborating with Dr. J. F. Thorpe, he produced the first edition of "The Synthetic Dyestuffs and Intermediate Products," which has remained the standard domestic work extending the subject to the stage required by advanced students. Meanwhile, he had been appointed manager and head chemist to Messrs. Brooke, Simpson & Spiller, then approaching dissolution, and remained with this firm until the plant was dismantled in 1906, when he became editor of the publications of the Chemical Society.

Although differing as widely as possible from his previous occupations, the literary duties then assumed by Dr. Cain were executed with an industry and a punctuality which, with the admirable co-operation of Mr. A. J. Greenaway, have been largely instrumental in maintaining the conspicuous value of the Society's Journal. His command of chemical data and his power of rapidly indicating sources of information were a substantial benefit shared by authors and by the Publication Committee. In the intervals of this work he turned to laboratory practice, and in 1907 developed an ingenious constitutional representation of diazo-compounds which was followed in 1908 by the first edition of another book, entitled "Chemistry of the Diazo-Compounds," which appeared in a second edition a year ago.

Remaining conversant with factory operations by conducting inquiries of a more practical nature, he was well equipped to serve once more in that branch of chemical industry which had been most neglected by this country prior to 1914, namely, the manufacture of high explosives, fine chemicals, and dyes. His work on the staff of Lord Moulton consisted in advising as to the applicability of plant in the various chemical factories to the requirements of explosives production, followed by periodical inspection of installations thus translated with a view to increasing economy of material and efficiency of operation. He next joined the Technical Committee of British Dyes, Ltd., and was located at Huddersfield for the following two years, being in charge of the new plant for the greater part of this period and rendering most valuable service in the concerted effort then being made to meet the shortage in colour supply.

In 1917 he co-operated with Mr. E. C. Powell in establishing a branch of the fine chemical and dyestuff industry in the London area; at the same time he gave most useful assistance to the Gas Warfare Committee, and participated in advancing the manufacture of sodium permanganate to the quality demanded for gas-masks. Throughout these exacting labours he continued to direct the publications of the Chemical Society with unfailing precision, and in 1918 published a third book, namely, "The Manufacture of Intermediate Products for Dyes," while his revision of "Roscoe and Schorlemmer: the Non-Metallic Elements," appeared only a few months prior to his death. This occurred suddenly, on January 31, and was doubtless accelerated by the unsparing demands which a deep sense of duty and an unfailing devotion to chemistry led him to impose on a weakened constitution.

Thus his life, although shorter in years, was longer in achievement than is given to most; moreover, he was happy in his home life, his work, and his friendships. Serious or joyous, as fitted the occasion, he remained to the end a trusted colleague, a companion of quickening sympathy, and a chemist of unquenchable eagerness.

The British Association

To the Editor of THE CHEMICAL AGE

SIR,—It is to be feared that, if the Asquithian policy advocated by Professor Smithells to wait and see be followed, there will soon be little to see. It is strange that we do not all realise that the good old times are gone—not only that the picnics we have so much enjoyed in the past are now too costly an indulgence, but that a serious responsibility is cast upon us and that, if we do not at once shoulder it, our chance is gone. At present, the Association has neither headpiece nor tailpiece, nor effective leadership; no leisured amateurs are at hand capable of doing constructive work along the new lines that must be followed to make the body of public service. A multitudinous meeting has been summoned for the 25th, but it has no programme; no multitude can evolve one that will be in any way satisfactory.

I recently received the Cardiff Report and have read through the addresses delivered by the 10 Sectional Presidents. All are rich in findings, but not one of those delivered in the sections of pure science is written in honest English; all are more or less disfigured by jargon, and the woman's is the worst of the lot. Outside science, even the staid Sir Robert Blair is shown hugging Psyche. The President had the temerity to chide Cardiff for its failure to advance our knowledge of the sea! Cardiff may well retort, "How can you claim to be doing anything as an association to advance the knowledge of science among the masses when you out-babel Babylon and confound even yourselves?" I should like to understand the address on heredity, but scarce a line in the latter part is readable—if a Rosetta-stone, in the form of a glossary at the head of each address, were provided, it might be possible painfully to spell out the meaning in slow course of time; but no, the technical terms are flung at us in all their stark nakedness.

The first lesson to be drawn from the Orange Book clearly is to insist that all addresses, in future, be written and delivered in simple English. Sir Quiller Couch might well be asked to take the chair in economics and lead the way—for it is not economy to write, print and publish what cannot be read.

In so far as the Association is continued on the old lines, in future, it should serve to bring us together, by making clear the meaning of borderland studies and weaving together the scattered sources of information, while appraising their value. I have already spoken of the fascination Professor Eddington's address has from the outsider's point of view. Dr. Bather's is another example of the address that is wanted. Both, however, suffer from the fact that their linked sweetness, instead of being long drawn out, is miserably curtailed. Not a few two-line statements in the geological summary need two pages at least to make them clear.

Space might so easily be gained by reducing the reports—if left out, quite a few "never would be missed." Surely

the Mathematical Reports are out of place. Professor Baly's ramblings ought to have been restrained by his committee. In Bishop Welldon's message there is little but the obvious. Far too much licence is allowed to jelly-fish chemistry; the greater part of the copy might well have been "sorbed" by the paper-basket. The admirable thesis should be re-written in the vernacular; *micelle* can never be an English word, and sorption is an insult to the genius of our tongue. It must be joy to the Shell Co. to learn from the report that, "According to Wo. Ostwald ('A Handbook of Colloid Chemistry,' p. 103), petroleum oil fractions of high boiling point are to be classed as iso-colloids—*i.e.*, a category in which disperse phase and dispersion means possess the same (or analogous) chemical composition." The statement should distinctly ease the oil situation with America. So lucid, isn't it? So perfect an example of the clarity and precision of scientific language. One is reminded of Ruskin's reference in *Praeterita* to Johnson —"he secured me, by his adamantine common sense, for ever, from being caught in the cobwebs of German metaphysics or sloughed in the English drainage of them." We have too long been sloughed in the English drainage of Teutonic physical-chemistry; a heavy dose of Johnsonian adamantine common sense may well be taken by the rising school.

One of the most enlightening of all the addresses is that on Engineering. This might be a second subject of attack. It seems we don't know how to test the strength of anything. If such an address were amplified and made clear in every line, it would interest mechanics by the million. Professor Jenkin might be asked also to suggest ways of leading the fraternity of engineers to master scientific method. Engineering is our staple industry, and we cannot afford to allow its leaders to remain in the sorry state of ignorance their spokesman depicts.

It is in the power of the Association to do much, if it will make its Orange Book a feature of each year—one that is eagerly awaited by inquiring minds throughout the country. It should not be left to Mr. Wells alone to amass a fortune, by informing the public in readable terms; the Association might succeed where he has failed, and even convert Messrs. Belloc and Chesterton to ways of righteousness. There can be no more tall talk about science and its value to the community, if something useful be not accomplished. The Association would do well to take as its motto the late Lord Fisher's recommendation to—

"Build few, but build fast,
Each one better than the last."

—Yours, etc., HENRY E. ARMSTRONG.

The Petrol Report

To the Editor of THE CHEMICAL AGE.

SIR.—I was very interested to read your article on page 148 of your issue of February 5, commenting on the Profiteering Committee's Report on Fuel.

I cannot, however, agree with your remarks concerning benzol for the following reasons. It is generally recognised that the benzol in the gas is practically speaking the sole illuminating constituent in such gas, and whereas scrubbing for benzol practically totally eliminates illumination as in flat flame burners, it only reduces its calorific value by 5 per cent.

As far as the gas consumer is concerned, a ton of ordinary gas coal contains some 6,600,000 B.T.U.s, as the following calculation will prove, An average ton of coal will give some 12,000 cubic feet of 550 B.T.U. gas, $12,000 \times 550 = 6,600,000$.

Two gallons of crude benzol should certainly be obtainable from each ton of coal carbonised, and as 1 gallon of benzol contains 8·8 lb. of benzol vapour, and 1 lb. of benzol vapour contains 18,000 B.T.U.s, it will be seen that $2 \times 8{\cdot}8 \times 18{,}000 = 316{,}800$ B.T.U.'s, which 316,000 represents, therefore, the calorific value taken by the gas in scrubbing for benzol.

Translating these figures into therms, and taking the value of the therm at 1s. 3d., 316,000 B.T.U.s represents a value of 3s. 11½d.

According to the latest quotation, crude benzol is quoted at 2s. 4d. per gallon, and the gross comparative value, therefore, of selling benzol in liquid form is 4s. 8d., as against 3s. 11½d.

Against this has to be put the cost of the actual scrubbing, which, under no circumstances, should amount to the difference shown.

Indeed, if your contention were correct, it is strange that such large concerns as the South Suburban Gas Co., Leeds Gas Co., Norwich Gas Works, Brentford Gas Works and others should continue a practice apparently unremunerative.

In conclusion, I would point to the following extract:—

"The needs of the Explosives Department have stimulated the adoption of 'stripping' for the production of benzol and other hydrocarbons, and the gas undertakings are now alive to the importance of these hydrocarbons as by-products, and the sale of which may help to reduce the cost of the primary gas supply. The future of these by-products will, it is to be hoped, no longer depend on their use for the manufacture of explosives on the scale of the past four years; but their use as motor spirit is likely to extend and to increase, and will provide an outlet for all that is not required by the synthetical chemical industry. (Report of the Board of Trade by the Fuel Research Board on Gas Standards, Command 108 of 1919, page 3, section 16.)"

It was entirely on the basis of the report quoted above that the new Bill was introduced last year, and it cannot fairly be said, therefore, when speaking of the Profiteering Committee's Report, that two departments are at variance and that the new legislation was directly antagonistic to the recovery of benzol.—Yours, etc., ROBERT H. MONTGOMERY.

Fanum House, Whitcomb Street, W.C.2. Fuel Department, Automobile Association & Motor Union.

February 11.

[Our editorial note (which was written before the receipt of the above letter) will, we think, indicate that Captain Montgomery's calculations only deal with part of the argument. As regards the list of gas undertakings Captain Montgomery mentions as continuing "a practice apparently unremunerative," he has overlooked the fact that all the concerns named are still selling gas on a *volume* basis, and are not yet operating under the *therm* regulations. It remains to be seen whether, when they operate under the new Gas Act, they will continue to strip for benzol. If they do, they will not, as purveyors of therms, be doing the best by their aromatic hydrocarbons.—ED. *C. A.*]

"Round a Bottle"

To the Editor of THE CHEMICAL AGE

SIR.—Your story of the eminent chemist of clerical aspect provokes one to make further investigation. Can you, without betraying confidences, answer the enquiry contained in the following?

ADDRESS TO BACCHUS

Thou, who with wine and other liquors
Hast inspired bishops, popes and vicars,
Oh may thine aid and inspiration
Long remain a blessing to the nation!

'Tis said that chemists after their work
Have invoked thy glad refreshing powers
In rooms marked by the Head of a Turk
Before and during, also after, hours.

Say, did the man of countenance severe
Find a land of plenty or of want? If
(Were the truth well known) he did appear
More like a bishop or a pontiff?

—Yours, etc.,
February 6. AGRICOLA.

[The query put by our correspondent would, we fear, lead us out of our depths. Besides, these rites have a sacramental character not to be lightly invaded by the profane or the too curious.—ED. *C. A.*]

French Potash

With the approach of the planting season the trade in potash fertilisers shows signs of improvement; but, as in the case of other fertilisers, considerable difficulties have to be overcome in organising the market so that the losses which have been sustained through the recent fall in prices may be equitably adjusted. Quotations for Alsatian potash salts are approximately as follows: French kainit, 14 per cent., £6; French potash salts, 20 per cent., £8 2s. 6d.; and muriate of potash £26. The demand for sulphate of potash is insignificant. Under the present depression it is too costly either for direct application or for the preparation of high grade compound manures.

Chemical Manufacturers' Luncheon to Lord Moulton

Importance of the Fine Chemical Industry

On Wednesday at the Princes' Hotel, Jermyn Street, W.1, the Association of British Chemical Manufacturers held a luncheon, at which Lord Moulton was the principal guest. Sir William Pearce, M.P., presided, and amongst others who were present were Professor H. E. Armstrong, Sir Henry Birchenough, Sir Napier Burnett, Sir Sydney Chapman, Mr. N. Grattan Doyle, M.P., Dr. Camille Dreyfus, Dr. M. O. Forster, Sir Sydney Henn, Major J. T. Hewitt, Colonel Hilder, M.P., Lord Inverforth, Sir Philip Magnus, M.P., Dr. Stephen Miall, Sir Harry McGowan, Sir Alfred Mond, M.P., Mr. M. Muspratt, Sir George Newman, Professor W. H. Perkin, Sir W. J. Pope, Sir Robert Robertson, Sir Joseph Turner, Mr. W. J. U. Woolcock, M.P. (general manager of the Association of British Chemical Manufacturers), and others.

Sir William Pearce

Proposing the toast of Lord Moulton, Sir William Pearce referred in glowing terms to his brilliant career, to his excellent work in connection with the Committees on Chemical Products and High Explosives, and to his work during the war as Director General of Explosive Supplies. He was thankful that when this country was in danger they had not taken Lord Moulton for a judge, but as a scientist and a chemist.

The country should realise that in the event of a future war we shall depend even more on chemicals than we did in the last one. Germany had realised years before the war the great part chemicals would play. The year 1913 saw them developing the Haber process for obtaining nitrogen from the air, the production for that year amounting to 30,000 tons of sulphate of ammonia which they disposed of between £5 or £6 per ton. Germany placed great faith in her supplies of nitrate of soda by means of which she hoped speedily to end the war.

Referring to the Dyestuffs Bill, Sir William paid a tribute to the valuable service rendered by Lord Moulton in that connexion. At the most critical period of the debate, when the Bill was in great danger, Lord Moulton entered the debate, changing the whole atmosphere. There was no doubt that the passing of the Bill was largely due to Lord Moulton's efforts.

Sir William compared industry to a piece of mosaic, one piece depending upon another. The dyestuffs industry must depend on the successful manufacture of fine chemicals and drugs, and if the nation only took the proper view, protection would be afforded to fine chemicals and drugs as well as to dyestuffs. The report issued by Lord Balfour's Committee said that the manufacture of organic and synthetic chemicals was essential for the national safety and recommended the prohibition of imports except under licence for five years. Mentioning a number of chemicals which had never been produced in this country before the war, the report stated that it was doubtful if their manufacture could be continued after the war without State assistance. Continuing, Sir William said that in Germany, not only industry itself, but the Government as well, regard organic and synthetic chemicals as the best industry the country possesses; in fact it was classed above the steel industry in importance. The fine chemical industry was Germany's best hope of recovering prosperity, and even supremacy, so securely was it established. It was high time the nation understood that the future will prove the supreme importance of this industry; without such an industry of her own no nation could be classed as first class.

Lord Moulton might well be described as a great missionary, and they could rely upon him to impress the nation on the urgency of safeguarding our "key" industries.

Lord Moulton

Replying, Lord Moulton said he was speaking at the most critical moment in the existence of the Association of British Chemical Manufacturers and of England. During the war he was never free from anxiety on account of what the chemical industry had enabled our enemies to do. He was urging the Treasury to buy nitrate of soda from Chile while his enemies were making it in unlimited quantities at home. I speak, he said, with all the feelings of a man who has gone through years of apprehension with regard to the very matter which is before this gathering to-day. The strength of the German chemical industry was due to the years of experience in manufacture and to the wisdom of the Germans in appreciating that it was the most fruitful of all industries. That, however, was not all, the German was quick to appreciate that the real competition was not with his next-door neighbour. What he wanted was that he and his rival should take command of the world's markets. His real rival was anyone outside Germany and in this connexion it was a regrettable fact that there were very few rivals. The German had watched year by year with rising delight the willingness of other countries to get their wants supplied in Germany. So marked had this tendency become, that the Germans came near to getting absolute control of the world's chemical industry.

Recalling the fact that he was an old Free Trader, Lord Moulton said he looked back without any feeling but delight on much that he said then. His present definition of Free Trade was a little more elaborate than that which used to satisfy him. He used to say with confidence that the most rapid way to national wealth was to buy in the cheapest market. The last few years had taught him that the definition should be enlarged. If our main object was the acquisition of wealth, the best way was to buy in the cheapest market, provided that we enjoyed a state of continuous peace; the last five years, however, had shown us that we cannot calculate on a continuous peace. These years have taught us that our main object should not be the most rapid acquisition of wealth and its enjoyment. It should include the most perfect development of its greatest asset, its own people.

Lord Moulton expressed surprise that when the war broke out, some Free Traders did not enter into a contract with Krupp for the supply of our ironclads on the assumption that they would accept his tender if it was the lowest. They forget there are things just as essential, although used for peace, as munitions; we no more dared leave our industries at the mercy of a foreign country than our guns and munitions of war. The German trader realised that his competitor in Germany was his friend in foreign trade and the existence of immense combines placed them in a position to deny any of their products to any foreign country.

The Government must realise that if it calls upon industry at a time of national danger, its duty to that industry does not cease at the end of the crisis. It must be made to appeciate the fact that it made infant industries supply its essential needs during the war and then left them still in a state of infancy, however efficient, to stand up unaided against enemy competition; to think for a moment that they could withstand unrestricted competition was sheer folly.

He often felt that the political element in us found formulæ so convenient that it loved to stick to them on all occasions. It would be almost as sensible for a man not to realise exceptional conditions and to adapt his policy to the needs of those conditions as for a doctor with a strong belief in the nutritive qualities of beef steak to supply that dish to a man suffering from typhoid fever. One great inexorable rule in Nature was that you must take the consequences of your acts; the consequences of allowing these essential industries to die under ruthless foreign competition could easily be imagined by everybody.

On the question of the remedy the A. B. C. M. would be prepared to accept, Lord Moulton said he did not think anyone would think to solve the problem by any system of permanent subsidies or import duties. He believed that the British chemical manufacturer was capable of producing goods which could not be surpassed by any other nation. He had dealt during the war with many people who were starting up new industries, and he had never failed to notice their supreme ability to deliver the goods; he had illimitable faith in the British chemist. He was convinced that no other chemists were superior in quality to ours, although others had more experience.

Given a system of licensing which would protect the industry from being swamped by enemy competition, we must

take advantage of that breathing space to develop research until we needed no help and feared no enemy. The production of nitrogen from the air, said Lord Moulton, was of the greatest national importance and must be undertaken on a large scale.

We ought, with one voice, to insist on protection until we had established our industrial position; our intellectual position was already established, but the difference between achievements in the laboratory and their commercialisation was so vast that experience on the industrial side was needed, and for the accomplishment of this a fair breathing space was needed. We should insist on having this breathing space, not as a favour, but as a right.

In conclusion, Lord Moulton trusted that, when the members of the Association met together again, adequate protection would have been given to the chemical industry. The future of every nation with a dense population like Great Britain absolutely depended on the extent to which it had realised the claims of chemistry and the need for placing it industrially on a firm basis. The success of the Association of British Chemical Manufacturers at this juncture would mean the salvation of industry.

Catalysis in Industrial Chemistry

Various Types of Reaction

AT the Royal Society of Arts, on Monday, Dr. E. K. Rideal delivered the first of a series of three Cantor lectures on catalysis. The remaining lectures will be delivered on February 21 and 28, and will deal with processes of oxidation and processes of hydrogenation. The lecture on Monday was of an introductory character, and gave a classification of catalytic action, and outlined the theories of catalysis and the technical difficulties.

Before coming to the lecture proper, however, Dr. Rideal made a few preliminary remarks as to the reasons which prompted him to select the subject of catalysis when asked to give this series of lectures by the Council of the Royal Society of Arts. In the first place, two previous series of lectures had been given, one on the importance of the general conditions of chemical equilibrium and the general fundamental laws of thermo-dynamics by Dr. Philip, and a second, by Mr. Chapman, on micro-organisms in special reference to the enzymes, which formed one of the most important branches of catalytic chemistry. The second reason why he proposed to deal with catalysts was the result of the war. The whole world was now faced with the problem of production, and, at the same time, giving the worker more leisure and greater opportunities for improving his conditions. This involved sweating the machine rather than the man, and that was one of the greatest functions of the catalyst. A third reason was that we were becoming increasingly interested in the structure and the nature of matter, and it was probably by the catalyst that we could best approach this problem.

A most important aspect of the study of matter was the possibility of obtaining large quantities of energy when matter was converted from one form into another. If, for instance, it was possible to find a catalyst which would turn $1\frac{1}{2}$ cubic ft. of hydrogen into helium, we should at once have energy equivalent to 6,000,000 cubic ft. of gas of, say, 400 B.Th.U. calorific value. That was the sort of prospect which was opened up by the study of catalysis.

Homogeneous Reactions

He divided catalysts into three definite types, viz., homogeneous catalysts, heterogeneous catalysts and catalysis produced by radiation. In the first type the reactions were those which took place between two liquids or two solids; in the second type the reactions were those which took place between a liquid and a solid or a liquid and a gas, whilst in the third type the catalysis took place under the influence of radiation from light, heat, ultra violet light, X-rays, &c. Instances of the various types of reaction were given, but as the ordinary text book merely stated that certain substances such as manganese dioxide, cobalt chloride or colloidal platinum were catalysts, and did not trouble to explain the matter further, it was his intention, said Dr. Rideal, to go a little more deeply into the problem, having regard to the manner in which the more simple of the reactions were the prototypes of great industrial processes now at work all over the world, and in the future would have a very marked effect upon all branches of chemistry.

Discussing homogeneous reactions, it was explained how the addition of water and acid to methyl acetate produced methyl alcohol, and that the process could be reversed—viz., that methyl acetate could be obtained starting with methyl alcohol and acetic acid. There were one or two explanations of the action. One was that it was the hydrogen ion which mattered; another was that the undissociated atom played a part, whilst a third was that radiation played a part. This latter had been developed by the aid of the quantum theory, but that allowed so many things to be done that one got a little bit afraid of using it too far. Although the first theory held the field to some extent now, it was, nevertheless, known that the undissociated atom was to some extent active, and that was proved by the fact that if the concentration of the hydrogen ion was decreased and the undissociated acid increased, the catalytic activity increased. There was experimental evidence to the effect that the activity of the hydrogen ion was not proportional to its concentration. At the present moment there was no satisfactory explanation of why some atoms reacted and many others did not, but he believed that photo-catalytic chemistry would eventually provide a solution to the problem. The industrial application of homogeneous reactions were valuable because it had been found possible to increase the activity of the hydrogen ion otherwise than by increasing the concentration. By strong solutions resistent things such as cellulose could be hydrolysed, whereas that had not yet been found possible with weaker acids. This foreshadowed the possibility of increasing the rate of homogeneous reactions by radiation, although the time had not yet come for that.

Rate of Reaction

The rate of reaction in heterogeneous reactions would be governed by the rate at which the catalysts went through the adsorbed atmosphere. Recent experiments on surface tension had shown that on the surface of a liquid and a gas, or a liquid and another liquid, the molecules had a particular orientation, and that this had an important effect upon the rate of the reactions. Two simple instances of heterogeneous reaction were mentioned and discussed—viz., the exposure of a piece of platinum to hydrogen and oxygen, in which the two gases combined upon the surface of the plate, and the combination of carbon monoxide and chlorine on charcoal, which formed phosgene or mustard gas.

Discussing industrial applications of homogeneous and heterogeneous reactions, an indication was given of the greater difficulties with the latter compared with the former. Most of the things that happened in the laboratory in connection with homogeneous reactions also happened on the large industrial scale, but with heterogeneous reactions the position was very different. The outstanding difficulty was with poisons which rendered the catalysts ineffective. The most serious of poisons was sulphur, and these poisons took the form of molecules which settled upon the catalysts, and remained there a long time, whereas, in the ordinary course of the reactions, the molecules stayed quite a short time. These poisons varied in degree in their effects, but it had been possible to get over the difficulties thus introduced by what were called promoters, or, in short, the addition of a catalyst to a catalyst. For instance, in the synthesis of ammonia, in which iron was the catalytic agent, the activity of the iron was increased considerably by the addition of a small quantity of soda. The great difficulty, however, was to know how these promoters actually worked, and although there were several theories, a great deal of experimental work remained yet to be done before we could speak definitely of promoter activity, because it was only during the past few years that the subject had been investigated systematically.

Dye Industry in France

THE manufacture of dyestuffs is now being taken up in France keenly, considerable progress having been made in the last two years in the transformation of factories for commercial work. The Compagnie Nationale des Matières Colorantes et des Produits Chimiques has already produced large quantities of synthetic indigo and experiments are being made in the production of various basic colours. Another firm which shows signs of further developments is the Societé Chimique des Usines du Rhone which, it is reported, will shortly increase its capital to 21,600,000 francs by the issue of 184,000 shares of 100 francs each at a premium of 15 francs.

Studies in Capillarity

Faraday Society's Joint Conference in Manchester

A JOINT meeting of the Faraday Society and the Manchester Literary and Philosophical Society was held in Manchester on Friday, February 11, and presided over by SIR HENRY MIERS, F.R.S., President of the Manchester Literary and Philosophical Society, and PROFESSOR ALFRED W. PORTER, F.R.S., President of the Faraday Society. The subject discussed was "Measurements of Surface Tension," and it was opened with papers by Dr. ALLAN FERGUSON and P. E. DOWSON.

Methods of Measuring Interfacial Tensions

IN the first paper by Dr. Allan Ferguson on "Some General Considerations and a Discussion of Methods for the Measurement of Interfacial Tensions," it was stated that the series of experimental studies in capillarity dealt with owed its immediate origin to the pressing necessity for reliable values for the surface tensions at liquid-gas surfaces, at solid-liquid surfaces, and at solid-gas surfaces. An equal need existed for a knowledge of the temperature coefficients of these quantities, and of the contact-angles of liquids with solids, a need which had grown with, and was further emphasised by the remarkable development during the last generation of colloid chemistry and physics. The value assigned to a surface tension varied very greatly with the experimental method employed, and, while it was true that much excellent experimental work had been done, it was equally true that much of the work had suffered from a lack of co-ordination, and from a want of appreciation of the dynamical and mathematical principles involved. Indeed, a large part of the recent work on surface tension was characterised by an accuracy of experiment which verged on the meticulous, accompanied by vague dynamical argumentation in which writers had been saved from serious mistakes of the hundred-per-cent. order only by a providential cancellation of errors.

Dr. Ferguson said he proposed briefly to discuss the various known methods for the measurement of capillary constants, and to consider which of them might most usefully be employed in the measurement of interfacial tensions. There was little need to enlarge on the importance of an *accurate* knowledge of the tension at a liquid-liquid interface: the values of the existing figures, determined as they often were by the aid of stalagmometers, visco-stalagmometers, and other instruments of hybrid derivation and of doubtful accuracy, were open to more than a little suspicion.

Without venturing to lay down cast-iron rules, he gave an outline of a systematic attack on the problem, which would have been carried farther during the last year, had the work not suffered interruption by the heavy demands due to the unprecedented influx of students into that and other teaching institutions. Briefly outlined, the scheme of work was as follows:—

(*a*) General considerations, with a review of those methods which are most likely to prove suitable for the measurement of interfacial tensions.

(*b*) Improvements in the capillary-rise method.

(*c*) An experimental study of the limits of accuracy of Jaeger's method.

(*d*) A comparative experimental study of the other principal methods, elucidating the sources of error in, and the consistency of these methods.

(*e*) The development of methods suitable for the measurement of—(i) interfacial tensions, (ii) the surface tensions of substances only obtainable in small quantities, and of substances such as molten metals, (iii) contact angles.

(*f*) The systematic measurement of—(i) the surface tensions of selected classes of organic compounds, paying special attention to temperature coefficients, (ii) interfacial tensions (iii) contact-angles of liquids in contact with glass and with other solids.

Much difference of opinion existed concerning the reliability of the "Jaeger" method for the measurement of surface tensions. Experiments were now in progress in which the extruded bubble was photographed under various pressures; the information thus acquired should serve as a criterion of the reliability of the method.

Surface Tension Values for Water

The paper contained a table of some of the later values obtained for the surface tension of water. The varying values obtained served to emphasise the difficulties inherent in the subject. Personally the author was convinced that the most potent factor in producing this variation was the difficulty of preparing a perfectly pure substance (or surface). The exact conditions under which the various mathematical approximations held good were well known, and, provided these conditions were fulfilled, the approximations provided would represent the experimental results with more than sufficient accuracy. But the only satisfactory way of settling this point was to undertake the research outlined under heading (*a*).

T_{15}.	Observer.	Method.
73·26	Volkmann	Capillary-rise.
73·46	Domke	Capillary-rise.
73·72	Dorsey	Ripples.
73·45	Hall	Weighing tension in film.
73·76	Sentis	Capillary tubes.
74·22	Watson	Ripples.
73·45	Ferguson	Pull on sphere.
74·30	Pedersen	Waves on jet.
72·78	Bohr	Waves on jet.
74·22	Kalähne	Rippled surface used as diffraction grating.
73·38	Richards and Coombs	Capillary-rise.
73·88	Ferguson	Jaeger's method.
73·55	Brown and Harkins	Capillary-rise.

This evidence indicated that considerable confusion existed as to what problems had been, and what had not been exactly solved; and that where the problem is incapable of exact solution, needless doubts had arisen concerning the value of the approximations given, and the conditions under which the approximations hold good. The paper went on to show that, even in those cases which were usually considered to require complex analysis, second order corrections might be reached by the aid of very simple mathematics, involving nothing more recondite than a few standard differentiations and integrations.

The problem of the measurement of the tension in a liquid-liquid surface was for the colloid chemist, one of pressing importance, and the attempts made, up to the present, to forward its solution were of very doubtful value. The discussion of the agreement between theory and experiment in the case of the Gibbs-Thomson adsorption formula was pointless unless they had an experimental method above suspicion. At present the agreement was apparently considered good if the observed and calculated results differed by less than 100 per cent., while some substances might show adsorption from 20 to 100 times greater than that calculated from the formula. It was sheer waste of time to discuss reasons for these differences so long as the experimental methods were open to suspicion. The great majority of the figures for interfacial tensions were obtained by some modification of the drop-weight method, in which, instead of finding the weight of a given number of the drops, the number of drops formed was determined by a given quantity of liquid.

Capillary Tube Method of Measuring Surface Tensions

IN a second paper, prepared by Dr. Ferguson and Mr. P. E. Dowson on "A Modification of the Capillary Tube Method for the Measurement of Surface Tensions," the authors pointed out that the importance of surface tension measurements in modern colloidal work rendered it imperative to develop a method which should be rapid, accurate and not make too heavy a demand on the instrumental equipment of a technical laboratory. It was the unanimous opinion of workers in this branch of physics that the capillary-rise method was very difficult in practice, and was the reverse of rapid. Practically all these troubles were swept away if, instead of measuring the rise of the liquid in a narrow tube, the liquid was forced down to the lower end of a tube immersed vertically therein, and the pressure required to effect this was measured on a convenient manometer. The advantages claimed for such an arrangement were the following:—

1. Calibration troubles are completely avoided. It is only necessary to measure, once for all, the bore at the end of a capillary tube of circular cross-section. This end is the position of reference for all liquids.

2. The capillary portion of the tube may be quite short, an the tube is consequently much more easily cleaned, and kept clean.

3. The thermostatic arrangements are much simplified. The liquid may be heated electrically, and temperatures taken by means of a fine thermo-couple placed quite close to the end of the capillary.

4. The use of the cathetometer is greatly facilitated. It is far easier to measure the difference of level of the surfaces of a liquid in the limbs of a pressure gauge than to measure the rise in a capillary tube. Moreover, any convenient manometer may be used—a point of importance in a laboratory where appliances are restricted. As is easily seen, if the lower end of the capillary be just touching the liquid under observation, and the same liquid be used in the manometer, the difference of level observed will be equal to the height to which the liquid will rise in the capillary tube in the ordinary capillary-rise experiment. Clearly, a gain in sensitiveness is at once obtained by using a light liquid in the manometer. But as said above, any convenient pressure gauge may be used—the micro-manometer devised by Threlfall, the Chattock gauge, the differential liquid manometer, a small receptacle closed by a thin metal disc whose motion may be suitably magnified, or in the absence of these a sloping tube attached to a wide vessel and read by a millimetre scale will give satisfactory results. The cathetometer is not even necessary to measure the amount by which the capillary is immersed in the liquid. If the distance be determined by attaching a needle to the side of the capillary it is only necessary to form and to caliper a magnified image of the capillary and needle using a good photographic lens.

5. The time of the experiment is appreciably shortened. The accurate determination of a surface tension by the ordinary method is a tedious process, and not one to be adventured upon light-heartedly. In our own case we found that, density determinations apart, an experiment involving 32 separate readings of the cathetometer could be completed in about 1½ hours. We usually made eight determinations of the pressure, and eight of the distance between the needle-point and the end of the capillary. With a "naked-eye" manometer, this time could be greatly cut down.

The Need of a Standard Liquid

Dealing with the surface tensions of various compounds, such as benzene, toluene, and methyl propionate, the authors added :—Our experience of benzene has convinced us that this liquid is, for a standard liquid, more than a little treacherous. Whatever be the apparatus employed for the determination of surface tensions, it is clearly advantageous to have at hand a standard liquid which can be used to test the apparatus. We ourselves feel that benzene is far from being the ideal liquid; for it in several respects falls short of such a standard, which should be easily prepared, be easily purified, be non-hygroscopic, not be liable (like water) to surface contamination, and not attack glass.

University of Dublin

Proposed Extension at School of Chemistry

THE report of the Royal Commission on the University of Dublin recommends that a fixed salary of £1,000 should be attached to the professorships of chemistry and applied chemistry. The Commissioners consider that the present staff associated with these two professors is inadequate and recommend the appointment of a whole-time lecturer in physical chemistry at a salary of £500. An increase from £300 to £500 is recommended for the present chief assistant, while a second assistantship with a salary of £250 is advocated. The accommodation is described as being utterly inadequate; "it is much too small, its outfit is antiquated, and the whole place needs to be reconstructed and enlarged." It is proposed to add a second story to the present building, and it is estimated that the new constructions will involve an outlay of £20,000. The benches and other fittings will cost £8,500 and £3,000 will be expended on new apparatus. The Commissioners state that they are strongly of the opinion that this outlay of £31,500 is urgently needed and recommend that the work should be undertaken without loss of time.

Sir John Cass Institute

Instruction in Petroleum Technology

THE annual prize distribution at the Sir John Cass Technical Institute was held on February 10, when the prizes were distributed by Sir Frederick Black, K.C.B., who subsequently delivered an address on "Liquid Fuel in Peace and War."

The chairman of the governing body, the Rev. J. F. Marr, in giving a summary of the work of the Institute during the past session, stated that the total number of students was 1,060, a higher figure than in any previous year and an increase of over 50 per cent. on the previous session. An important development of their work they hoped to be able to realise shortly was the initiation of courses of instruction on petroleum technology adapted to the needs of those already engaged in the industry. They had received very helpful encouragement in connection with this project from representative members of the industry, and it was considered that the Institute was exceptionally well situated for the development of this branch of applied science.

In the course of his address, Sir Frederick Black said that, whilst the United Kingdom had become an important consuming centre of petroleum products, it was at present only on a comparatively small scale that petroleum either natural or derived from shale or coal was produced in this country. So far as manufacture or refining was concerned, much more work of that nature was likely to be undertaken at home, and it was probable that home production would also increase. Large British companies interested in oil had their headquarters and distributing agencies here, though their wells and refineries were mostly situated in distant countries.

The scientific and technical training of men for oil work, geological, chemical and engineering was already undertaken at such centres as Birmingham University and the Imperial College of Science at South Kensington in particular, where complete courses of instruction were given, similar to those in the mining profession.

The Sir John Cass Institute, whilst not expecting to compete with such centres, hoped very shortly to arrange courses of lectures for some of the staff of the oil companies, which should aid them in the efficient discharge of their duties. The governing body had prepared a scheme, modest to begin with, but capable of extension, and some of the large oil companies were assisting in working out the scheme and were favourably disposed towards practical help.

After briefly describing how the products of petroleum used for fuel were obtained, Sir Frederick proceeded to give a general description of their use in internal-combustion engines and for steam raising. If the war had not absolutely discovered any entirely new application of petroleum products, it had enormously developed their use and established their importance on land and sea and in the air.

He touched upon the relative advantages of oil and coal for marine purposes and the methods of handling, and made special reference to the progress in the building of motor-driven ships since the arival of the "Selandia" in the Thames in 1912 created so much interest. Great attention was being given, not only to the opening up of new sources of supply, but to such important matters as the elimination of waste on the oil fields and in the use of liquid fuels.

Oils that admitted of complete refining into such products as motor spirit, lighting and lubricating oils should be so dealt with, in preference to burning the more valuable fractions for steam raising, if a heavier oil not capable of such complete refining could be made available. He hoped that the new work to be undertaken in the Sir John Cass Institute would not be without useful results in respect of some of the problems of petroleum technology.

Chemical Industry in Jugoslavia

DURING the last few months considerable activity has been apparent in the chemical industry in Jugoslavia. At Belgrade a plant for the production of benzine and industrial oils is at present under construction and a chemical factory is about to be built on the banks of the Danube near Belgrade. A factory for the manufacture of chemicals has recently started work at Ossiek, Slavonia, while at Bjelovatz, Slavonia, the firm of S. A. Miris is building a plant for the manufacture of chemicals and perfumery.

A Panel of original and unconventional character studies, specially drawn in colour by Miss M. McLeish, their Stand (No 161) at the

Patent Law and Chemical Research

Patent Procedure

"A SHORT General Account of Patent Procedure" was given by Mr. Harold E. Potts, M.Sc., as the subject of the second lecture of the series he is delivering before members of the Liverpool Section of the British Association of Chemists on Monday evening. The lecture was given in the Chemistry Theatre of the Muspratt Laboratories, Liverpool University, Dr. H. A. Auden presiding.

Mr. Potts said the first step in obtaining patent protection in this country was usually the filing of a patent application. Except in cases originating abroad, the actual inventor must sign the application, although the name of another individual or of a firm might also appear, and, of course, the patent might be assigned to others when it was granted. There was often difficulty in deciding who was really the inventor, and this difficulty arose especially when research work was being done, so that it was much safer if the application were made in the joint names of all who had contributed anything of importance to the invention, *e.g.*, the research director who made the original suggestion, and the chemist who performed the laboratory work and contributed additional suggestions. If the names of the inventors did not appear on the application, the patent could be held invalid. The original inventor was entitled to obtain the aid of experts to work out his invention, and these collaborators did not necessarily become joint inventors, merely because, acting as the intelligent instruments of the inventor, they had made incidental improvements in his original idea, and shown that it was feasible in practice.

Provisional Specifications

Protection began from the date at which a provisional or a complete specification was filed at the Patent Office. The provisional specification must contain a statement of the nature of the invention. It was not usually sufficient to describe exactly what work had to be done, because it was also advisable to foreshadow future work. After the provisional specification had been filed it was examined at the Patent Office to determine whether it dealt with a new manufacture. This term was very wide, and included chemical processes of all kinds from small improvements in detail in existing processes, such as the choice of an optimum temperature of reaction, to wide patents broadly protecting a new reaction. Provisional protection lasted nine months, and one month's extension might be obtained on payment of a fine. During this time it was most important in nearly every case that experiments should be made to determine how far the provisional specification could be extended, or what correction or limitation it might require. The complete specification must then be filed, otherwise the application was abandoned, in which case it was important to note that the provisional specification was not published.

The complete specification should contain one or more examples, since it must give sufficient information to enable the skilled chemist to work the invention: not necessarily on the best commercial scale, but in such a way as to give some beneficial result. Secondly, the complete specification must contain a distinct "claim." The word claim was not used in its ordinary sense, but had a special technical meaning. The "claim" of a patent was a definition of what the inventor considered to be novel, and all his rights depended upon it. Thus, if the invention lay in the use of acetic acid in a certain process, instead of sulphuric acid, it would be wrong to claim the use of a suitable acid because this would not exclude sulphuric. Nor would it be wise to claim the use of acetic acid, because this would leave an infringer free to use other acids. The correct claim would form a weak acid, if boric acid or CO_2 would serve also, or a fatty acid, if formic and propionic, &c., were the only equivalents, and so on. The complete specification thus called for the utmost care in drafting.

A firm which pursued a consistent patent policy would study the literature very closely to see that its own patents were drafted so as to be valid and to amend them if fresh partial anticipations were discovered after the patents had been granted. This study of literature would also extend to the patents of competitors.

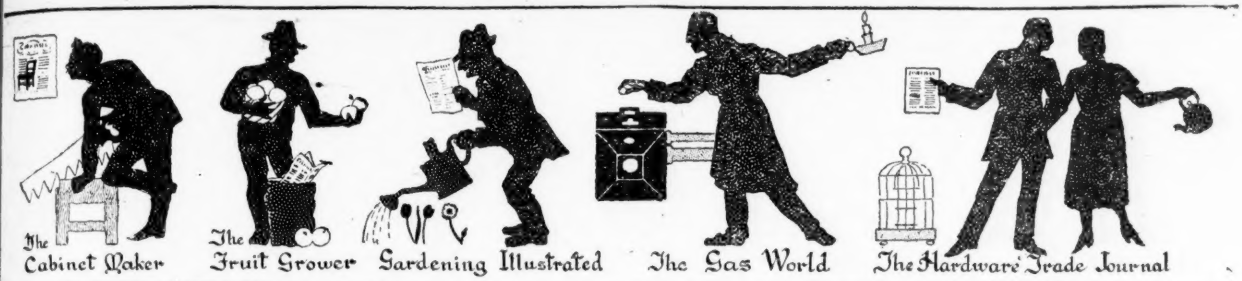
Foreign Patents

Dealing with foreign patents, Mr. Potts said there was an International Convention to which most of the important countries were signatories which provided that any application in a Convention country could be granted priority as of the day of application in the home country, if the foreign application were filed within 12 months of the British filing date. Patent procedure and laws of foreign countries varied widely. Germany, Holland and Sweden make a very rigid search through patent and scientific literature and freely reject patents if the invention has been anticipated. The American Patent Office was supposed to do this also, but the examination was not now so rigorous as it used to be. The French and Italian Patent Offices make no search at all. For chemical inventions, the most important countries were probably the U.S.A., Canada, Germany and France, while Belgium and Switzerland were also important. Each of the British colonies had its own patent law.

In order to illustrate the procedure in obtaining patents, contesting rivals' claims, sustaining original inventors' claims and carrying claims through actions in courts, Mr. Potts narrated very fully the history of the flour-oxidising cases, in which patents of John and Sydney Andrews, of 1901, for improvements in the condition of flour, semolina and the like, the Alsop gaseous-flaming arc patent for bleaching flour, and the Frichet process were concerned, all being invented to obtain very similar results.

Employees' Inventions

He then considered the relative position of employer and chemist. In general, he said, it was presumed that the inventions of an employee were his own, even if made in the employer's time and using the employer's materials. This presumption might be rebutted if it could be shown that the employee was employed for the purpose of inventing. It seemed clear that if a chemist in the analytical department of a works spontaneously made a suggestion for improving a process in the works, which was outside his daily employment, the patent would be his property, whereas, if a research chemist was definitely instructed to solve a certain problem, the patent would belong to his employer. Numerous intermediate cases were possible, so that in all cases it was best to avoid the difficulty of determining ownership by settling the matter beforehand by agreement. There was much to be said for the policy of paying the research worker adequately with reference to the patents resulting from his work, which would then become the property of the employer. At the same time, agreements might provide that although inventions belonged to the employer, successful patents should be



to illustrate the leading trade and technical journals published by Benn Brothers, Ltd., and exhibited at Efficiency Exhibition, Olympia

rewarded by an *ex gratia* remuneration to be given at the discretion of the directors, or a special committee of the directors. In these matters it was not possible to go very far unless there was a good deal of mutual confidence. The financial part of the reward was probably best given in the form of increases of salary and status, which would naturally follow the appearance of important patents.

Discussion

Mr. W. Mansbridge thought that the question arising out of the lecture was that of the position they held towards employers. What members of the British Association of Chemists were after, he said, was a better recognition of them by employers, and a discussion of that would be helpful to many of them.

Dr. A. Turnbull thought Mr. Potts had touched the crux of the matter in saying that there must be mutual confidence. As a research chemist, he said they had got to trust the employers and they would see them right. He did not see what one could do with employers until one had tried. His experience was that if employers who had research chemists would be generous with them, they would get more out of them in that way.

Oil and Colour Chemists

Paper by C. J. Seaman

At a meeting of the Oil and Colour Chemists' Association, held in London on February 10, a paper on "Grinding Mills" was read by Mr. C. J. Seaman. After describing some of the early types of flat stones and the general characteristics of grinding mills, Mr. Seaman said that the most important aspect of present-day mill work was the triple roller mill. There was no record when the first triple mill was made, but it was undoubtedly sometime during the last century.

Perhaps the first real advance was made when a paint manufacturer wanted a mill of a certain size but had not room to put it in. A special mill was deisgned in which one roller was placed underneath the other with a view to economising space, the two top rollers on the feed and end rollers being made smaller than the delivery roller. When that mill was put into operation it was found that it ground the material more finely. The real reason for this was, he believed, that the new action imparted to the rollers brought the material into such a position as it approached the rollers that it was crushed along the lines of cleavage. In that way the material was flattened more easily and the resultant effect was to improve the covering power of the ultimate paint mixture through the finer grinding thus obtained.

Discussing granite rollers, Mr. Seaman said next to the Scotch granites, Cornish granite was the best, but care should be taken to get it as free from mica as possible, because mica was one of the worst things in granite to be used for rollers. The best stone of all was porphyry, but the only quarry existed in Bavaria whence he used to get it before the war.

The bearings of grinding mills were more important than many people seemed to think. They needed to be of ample size and provision should be made for oiling. Scrapers were important, also, and the importance consisted in seeing that they could easily be put in place and taken off for examination.

Discussion

Mr. Fletcher Starkey asked what was the value of springs in roller mills and could they be used. He would also like to know the values of the various granites which were available as compared with chilled iron and steel rollers.

Mr. Bridge, referring to the edge runner mill, asked as to the relationship between the time of grinding and the size of the particles.

Mr. Haines said he was particularly interested in the remarks made with regard to the larger front roller in the case of three-roller grinding mills. He had found that type of mill to possess immense advantages, the chief reason being, in his opinion, that there was a very much larger grinding surface.

Mr. Tyson said it seemed to him that the surface of the pulleys used on most English machines, where belt driving was used, was much too small. The biggest pulley that he had come across was 5 in., and in his works they had changed several of them and substituted 7 in. or 8 in. face pulleys, and corresponding belts.

Mr. Dunster asked what was the relative output of a cone mill and a triple roller mill grinding zinc oxide or lead. The two things required to-day were output and fine grinding, and as regards both, the paint manufacturer was very much in the hands of the makers of grinding machines. He would like to know why prussian blue required grinding about 12 hours before it could be got fine enough, and that with a fairly up-to-date triple roller mill. Prussian blue was not a coarse pigment like barytes, which was very often in the shape of sand, and he would like to hear the views of other members.

Mr. J. Lawrence said he hardly thought it would be possible to standardise, say, half-a-dozen machines for the paint trade, as the author had suggested, although he agreed that if it could be done it would make things easy for the engineers from the technical point of view.

Mr. H. A. Carwood pointed out that in the triple roller mill, if the rollers were circular, they touched at a point which was immeasurable. In those circumstances he failed to see that they were really grinding.

Mr. H. Morgan wished to know if the author had any special means for ascertaining the coefficient of expansion of his rollers. Did he test the granite beforehand or did he simply run a machine and see how it worked?

Mr. R. P. L. Britton said he often wondered whether they knew quite what they did grind. They always had before them the idea that they broke the particles up and made them finer in the grinding, but that was very questionable and had not always been borne out by experience.

Mr. Seaman, replying to the discussion, said he was a strong believer in springs on these mills and yet he was also a strong believer in a positive movement on the roller. He had, however, patented a little arrangement of spring which would also give a positive movement, and it was being put in the latest Helix machines made by his firm. As to the relative merits of different granites it had taken him 10 years before he had felt competent to judge, and then it could only be done by a careful examination of each block. The point raised as to prussian blue reminded him of the difficulties which the Yost typewriter people had at first with the ink for their pads. It was found that the pads filtered all the colour out and so reduced the life of the pads very much. A specially fine grinding mill was made in England for the purpose and the results were satisfactory. This mill did the work in one-third the time of the old ones, and it had chilled iron rollers water-cooled. It was the peculiar hardness of the prussian blue crystal which made it so difficult to grind.

Notes on Chemical Engineering

Application of Biology

THE ninth meeting of the session of the Hull Chemical and Engineering Society was held at the Metropole, Hull, on Tuesday, February 1. Mr. R. A. Bellwood, M.I.Mech.E., presided, and there was a full attendance of members. Mr. A. R. Warnes, A.Inst.P., A.I.Mech.E., F.C.S., read a paper entitled "Notes on Chemical Engineering," in the course of which he said it was very surprising that so many people should have such a cloudy conception of what chemical engineering is, what a chemical engineer should know and how he should be trained. He had been told recently that a student who had taken a five years' course of training in chemistry with a certain amount of engineering stuffed into the last two years of this course, could be called a chemical engineer and was competent to follow that occupation. Others have told him that if a student takes a three years' course in chemistry and following this a three years' course in mechanical engineering, he could consider himself a chemical engineer. The lecturer was of the opinion that chemical engineering is a special branch of engineering which concerns itself with the design, manufacture and maintenance of plant to be used in the carrying out of chemical operations on the small or large scale, and a chemical engineer is a person equipped with sufficient special knowledge to enable him to carry out the work concerned with this special branch of engineering.

In the design and manufacture of chemical plant, he said, there is required a considerable knowledge of special chemistry (pure and applied), of pure and applied physics and mechanics, of the methods of testing the materials used, some knowledge of foundry and boiler-making practice, and also a knowledge of the principles of design, and of the use of engineering tools. After the plant has been constructed, it has to be erected and put into operation, and this requires a good knowledge of design and lay-out of works; generation of steam, electrical and gas power and control of the generating plants; use of of water power; fuel economy; building construction and concrete work; costing and the use of flow sheets; and last but not least, geology and biology. And even this list of subjects may not be complete, but it shows at least what a large number of subjects, and many of them of a special kind, are required to be known to make an efficient chemical engineer. How, then, can a chemist with a smattering of engineering or an engineer with a surface knowledge of chemistry be considered as an efficient chemical engineer?

To the majority biology is a science which should be studied by students of medicine, doctors of medicine, food analysts, manufacturers of food products and naturalists; its bearing upon chemical engineering seems to have received very little thought. Much structural iron and steel work, for which the chemical engineer is responsible, such as telpher and other conveyor systems, iron sub-structures, large storage tanks and pipe lines (for water) may be extended over large areas, or in the case of sub-structures and storage tanks erected in positions somewhat remote from the manufacturing centre of the works and therefore surrounded by vegetation of various kinds, and in most cases portions of the structure are buried in the soil.

Now iron and steel corrosion is somewhat of a nightmare to the chemical engineer, and although the majority accept the electrolytic theory of corrosion and many adopt some means to prevent it, some of the lesser-known conditions (viz., biological) which assist in the electrolytic corrosion of iron and steel, seem to be little known, and although in very obvious situations protective measures will be taken, in those not so obvious protection of the iron or steel is often thought to be unnecessary.

Causes of Corrosion

It is well known to biologists that certain sulphur bacteria, viz., the Beggiatoæ, live in water containing much decaying organic matter (such as occur in small pools in the vicinity of structures in areas covered with vegetation), and these bacteria obtain their sulphur from the sulphuretted hydrogen set free during decomposition. In fulfilling its natural function in the bacterium the sulphur becomes oxidised to sulphuric acid, and this when set free will render the water sufficiently acid to materially assist in the electrolytic corrosion of iron or steel structures which may be in the immediate neighbourhood.

The humus of soils is produced by the decay of vegetable matter, and certain species of bacteria and moulds aid in this process of decay. In the humus there occurs an acid body known as humic acid, approximating to the formula $C_{20}H_{18}O_9$, and there seems to be every reason to believe that this body will assist in the electrolytic corrosion of iron or steel. Humic acid is capable of forming double compounds with phosphoric acid, calcium oxide, iron oxide, and many other substances. Among other acids found in soils which owe their presence mainly to biological influences, and which can exert a baneful effect on iron or steel, are dihydroxy-stearic acid, picoline carboxylic acid, agroceric acid and ligno-ceric acid.

Further, it is a well-known fact that young roots and especially root-hairs, in addition to exhaling CO_2 (the action of which is well-known in iron corrosion) excrete other acid substances, the nature of which have not up to the present been much investigated. The liquid contained in the root-hairs of a large number of plants has been examined by Dyer* who found the average acidity expressed in terms of citric acid to be 0.910 per 100 of water. That these root-hair acids are corrosive can be proved by allowing roots to grow across a polished plate of marble, dolomite, or osteolite; or even ivory, when after a time an etched pattern of the shape and direction of the root-hairs will be found.

A type of corrosion known as "shell-rust" is at times found on iron and steel structures, which have been under water for a considerable time. This corrosion is probably due to colonies of a bacterium called Gallionella ferruginea, an organism which during its life-cycle excretes an acid material capable of dissolving iron and thus bringing about electrolytic corrosion. Iron pipes or conduits are not only corroded by biological influences, but also in the inside it has often been found that iron water pipes gradually become filled up with large masses of rust, mostly in the form of tubercules, and this form of choking is due to corrosion of the metal brought about by certain species of sulphur bacteria.

The biological corrosion of iron or steel is in most cases slow, but none the less harmful; and it should be remembered that if other favourable conditions exist, the exclusion of biological influences will not prevent corrosion.

Discussing catalysis in relation to chemical plant construction, the lecturer said although it was a subject of increasing importance it had not received as much attention as it should from the chemical engineer. The use of hot water under pressure for heating purposes did not seem to have received the attention due to it, especially as it offered a means of easy control, secured uniform heating and did away with local over-heating.

The subject of geology in relating to chemical engineering is at present in its infancy, and students would do well to pay some attention to it, especially to that branch known as surface geology. In the choice of a site for a new works the question of surface geology has to receive secondary consideration, the more important matters of river or canal, railway and main road conveniences having to come first. However, there are positions which possess all that is required in regard to favourable transport facilities to and from the works upon which it would be very unwise to build. For instance, if at a moderate depth only there exists a thick strata of peat, soft shaly or slippery clay, or shifting gravel, especially when one or more of these occur on the sides of an old valley; or if the underlying strata is cavernous. In the majority of cases, however, a more or less faulty condition of the underlying strata can be dealt with satisfactorily provided the trouble is taken to learn all that is necessary of the surface geology, from an experienced geologist, before commencing to put up a building or to erect plant.

Recent Wills

Mr. W. E. Moffett, of 23, Sea View, South Shields, leather and indiarubber manufacturer £9,249

Mr. C. Clifton Moore, of Reddish House, Lymm, Cheshire, managing director of Chas. C. Moore & Co., salt and chemical manufacturers, Lym £24,027

Mr. W. Shepperson, of Deerswood Cottage, Highfield, Sussex, formerly of the Pryers, Hampstead Heath, for twelve years the representative of Burroughs, Wellcome & Co., in Australia............ £32,095

* J. C. S., "Trans.," 1894, page 115.

Efficiency in Industry

Interesting Exhibits at Olympia

A VISIT to the Efficiency Exhibition, which was opened at Olympia on February 10 by Sir Robert Horne, supplies convincing proof of the progress made towards the ideal of 100 per cent. efficiency.

British Oil and Fuel Conservation, Ltd., are showing the Freeman Precision Temperature Control, which can be seen in actual operation, regulating the high and low temperatures precisely and automatically. Practical demonstrations are given daily of riveting and rock-drilling by the Dorman Wave Power tools, manufactured by W. H. Dorman & Co., Ltd, of Stafford.

A system of sewage purification which is a combination of æration, sedimentation and filtration is shown by the "Ærsedcen" Sewage Purification Plant Co. W. R. Patents, Ltd., display their W. R. Automatic CO_2 indicator by the use of which, it is claimed, a saving of from 5 to 15 per cent. can be effected. First aid boxes specially fitted for use in chemical and bichromate works and oil cake mills are included on the stand of James Woolley, Sons & Co., Ltd., while optical glass is displayed by Chance Brothers & Co., Ltd., of Smethwick, Birmingham.

The complete recovery of all the products from coal by low temperature carbonisation is demonstrated by Low Temperature Carbonisation, Ltd., who claim that if 200,000,000 tons of coal were treated by their process the following approximate results would be obtained: motor spirit, 400 million gallons; fuel oil, 2,400 million gallons; sulphate of ammonia, 1,350,000 tons; gas, 1,200,000 million cubic feet; and coalite smokeless fuel, 140 million tons.

The stand of the Regent Street Polytechnic contains an exhibit of a new colloidal soap which has been prepared as a result of investigations carried out in the school of Chemistry, while the Loughborough College exhibits include laboratory apparatus made by students of the college. Dr. Bedson's apparatus for determining the liability to explosion of various coal dusts and the inhibitory power of inert dust is on view at the stand of the Armstrong College, Newcastle. This apparatus consists of a glass bulb about 6in. in diameter, within which are placed a few grains of the dust to be examined; a pressure gauge is connected with the bulb. By means of a puff of air the dust is blown against a red-hot platinum wire; if the dust is capable of producing a colliery explosion a small flash of light is seen in the globe and the amount of energy developed is registered on the gauge.

The Department of Glass Technology of the University of Sheffield shows photographs of work in operation, and some interesting diagrams illustrating the resistant properties of British, as compared with foreign, chemical glassware. Samples of chemical glassware and a patent four-jet blowpipe, devised in the department, are also shown. Demonstrations of chemical glass blowing are given at intervals at the stand of Howard, Rawson & Co., Ltd., while in the annexe disabled ex-service men, although not yet fully trained, give highly creditable demonstrations of glass blowing.

The "Carbic" system of producing acetylene for lighting, welding and cutting is demonstrated at the stand of Carbic, Ltd., the basis of the system being the "Carbic" cake, which is composed of specially heated carbide of calcium, compressed into cylindrical blocks.

The Coal Smoke Abatement Society exhibits a large model prepared to scale to show the volume of soot deposited annually in London, as compared with the clock tower of the Houses of Parliament.

A special feature of Benn Brothers' exhibit is the unique and striking decorative arrangement of the stand, consisting of a frieze representing the activities of the various trade and technical journals and books published by the firm.

Mr. H. Foster Bain, who has been appointed to succeed Dr. Cottrell as director of the United States Bureau of Mines, is principally known as a geologist and mining engineer. During the war he was engaged on Belgian relief work in London as one of Mr. Hoover's assistants. He has served as editor of the *Mining and Scientific Press* (San Francisco) and of *The Mining Magazine* (London), and has conducted important mining investigations in South Africa.

Fertilisers and Feeding Stuffs Act

False Description Charge Fails

AT the Aylesbury Petty Sessions on February 12, J. L. Edgington, Ecclesall, Sheffield, horticulturist, was summoned by the Bucks County Council (the Ministry of Agriculture consenting) for a breach of the Fertiliser and Feeding Stuffs Act, by selling nitro-phosphate, and permitting a description of the article to be false to the prejudice of the purchaser. Mr. B. N. Reynolds prosecuted and Mr. C. G. L. Du Cann (instructed by Mr. W. Irvin Mitchell, Sheffield) appeared for the defence.

Harold Birchinell stated that he purchased 1 cwt. of the article. Under cross-examination by Mr. Du Cann he admitted that this was only done with a view to taking proceedings.

Mr. T. Kyle, official sampler under the Act in question, deposed as to sending samples to Dr. Voelker for analysis, when it was found to contain 2·51 per cent. of nitrogen, 13·13 per cent. of soluble phosphates, and 10·25 per cent. insoluble phosphates, and was therefore 2 per cent. deficient in nitrogen. A label on the bag in which the article was received stated that the nitro-phosphate contained 5 per cent. of nitrogen.

The defendant said that the fertilizer was manufactured for him by Messrs. Middleton & Sons, Worksop, who guaranteed that it contained 5 per cent. nitrogen, and on this assurance he had attached the label to the bag. He was unable to produce the manufacturers' guarantee, but quoted a letter to the effect that the nitro-phosphate contained the requisite amount of nitrogen and phosphates when it left their works. Answering his counsel Mr. Edginton stated that he did not know the description was false, neither could he, with reasonable care, have ascertained that it was false.

J. Calthorpe, general manager to the manufacturers, deposed that this firm gave the defendant the necessary guarantee, but stated that 1 cwt. was an unfair sample.

Chas. Watts (defendant's manager) gave evidence of placing the article into a railway truck containing lime. Mr. C. A. Jardine, a consulting horticultural specialist, explained that if lime and nitro-phosphate came into contact the former would probably absorb a certain amount of nitrogen.

For the defence, Mr. Du Cann submitted that no conviction under the Act could be sustained in view of the evidence, and certain sections of the Act. Defendant could not know, nor could he with reasonable care have ascertained—for it was preposterous to expect a trader to spend three guineas upon separately analysing every consignment worth thirty shillings or less—that the description was false. It was counsel's duty in fairness to point out, however, that though the defendant had no guilty knowledge he might be convicted under an Act to which innocence of fraud was no defence according to a leading case on the subject. Fortunately there were two saving clauses, and it was upon these the defence stood. Any reasonable doubt engendered by the lime theory the defendant was entitled to have resolved in his favour. He appealed to the Bench to weigh the evidence with scrupulous care, and said that he proposed to say nothing in mitigation of sentence for the present because he was confident they would acquit defendant.

After a retirement, the Chairman said the Bench were of opinion that the defendant did not know, and could not with reasonable care have ascertained, the deficiency in this instance. The case would, therefore, be dismissed.

The Brunner, Mond Litigation

Stay of Execution Granted

IN giving judgment for the Manchester Ship Canal Company in the case in which Brunner, Mond & Co., Ltd., and other traders disputed certain bills, Mr. Justice Sankey said on Wednesday that "he could not refrain from expressing his regret and feeling of shame at the protracted character of the litigation. He was not suggesting that anyone was to blame, but the costs must be reckoned in tens of thousands of pounds. It was his view that it was a matter that could be more easily settled by a round-table conference."

The hearing had extended over 26 days, from December 2 intermittently till January 26. Seven eminent K.C.s were engaged and fees to counsel alone ran into many thousands of pounds. Sir John Simon, K.C., and Mr. Upjohn, K.C., the two leaders, each got an initial fee of £2,000, with daily refreshers of £200.

A stay of execution was granted with a view to appeal.

Laboratory Glassware

Exhibition of British Manufactures

THAT British chemicals and chemical ware have made great strides in the last few years is amply shown by the exhibition arranged on Wednesday by the London section of the Institute of Chemistry at the hall of the Institute in Russell Square. In addition to chemical literature, members' exhibits, &c., the British Chemical Ware Manufacturers' Association, the Scientific Glass-Blowing Co., and Chemicals & By-Products, Ltd., exhibited samples of British-manufactured fine chemicals, laboratory glassware and porcelain which far exceeds anything of the kind hitherto exhibited. The importance of the exhibition is shown by the fact that the Institute of Chemistry has encouraged the exhibition to be held under its auspices. The Council of the Institute, of which Sir Herbert Jackson is president, having due regard to the necessity for maintaining supplies satisfactorily, both as to quality and quantity, for scientific and educational work, expressed the view more than a year ago that it was desirable to promote the manufacture of chemical glassware in this country and to give the manufacturers a fair chance within a reasonable time limit to establish the industry. Speaking in support of the Key Industries Bill at the time, Mr. Chaston Chapman, the next president of the Institute, said they were not unmindful of the debt owing to those manufacturers who had helped the country when supplies had been cut off from abroad and stocks practically exhausted. They could not now say "Good-bye" to those manufacturers without any effort to help them at the present juncture. On the other hand, Mr. Chapman, pointed out, laboratory glassware was so necessary that if the British manufacturers could not supply it the users must perforce obtain it elsewhere.

Affairs of the A. & O. Syndicate

Statutory Meetings of Creditors

Statutory meetings of creditors and shareholders in the compulsory liquidation of the A. & O. Syndicate, Ltd., 681, Salisbury House, London Wall, E.C., were held on Wednesday at the Board of Trade offices, 33, Carey Street, W.C. A statement of the company's affairs had been lodged showing gross liabilities £10,546 2s. 8d. and a deficiency in assets of £7,526 2s. 8d. As regards shareholders, an additional deficiency of £3,968 was disclosed, making a total deficiency of £11,494 2s. 8d.

Mr. E. T. A. Phillips, assistant official receiver, said the company was formed in June, 1917, with a nominal capital of £21,000, to carry on business as dealers in gums and oil prospectors and producers. It was promoted by Mr. Howard C. Parkes, primarily for the purpose of being made use of as an intermediary between himself and the Anglo-Colonial Dyes, Ltd., which was registered by the directors of the syndicate on June 29, 1917, to carry on business as manufacturers of dyestuffs, varnishes, acids, &c. The syndicate agreed to pay £3,000 in cash and £25,000 in shares of the Dye Company to Mr. Parkes for the benefit of his negotiations for the supply of yacca and other gums, and for other rights and considerations. On the same date the syndicate entered into an agreement with the Dyes Company for the re-sale to the latter of the rights relating to the gums taken over from Mr. Parkes, together with the right to use one of the expert's reports, for £54,000, plus certain royalties.

In October, 1918, Mr. Parkes acquired from Mr. R. Pearson a one-half interest in three inventions relating to the fixation of atmospheric nitrogen and other chemical processes. Mr. Parkes afterwards granted the syndicate a 10 per cent. interest in these inventions. In connection with this transaction the syndicate rented a laboratory, purchased apparatus and carried out experiments with a view to the production of nitrogen from the atmosphere.

According to Mr. Parkes, the Dyes Company had successfully produced dyestuffs, but its operations, which had been hampered by lack of capital, had now come to an end. A receiver for debenture holders was now in possession of the assets of the Dye Company. The syndicate's failure was attributed by Mr. Parkes to the inability of the Dyes Company to raise the capital necessary to enable it to extend its operations and to discharge its indebtedness to the syndicate.

The liquidation was left in the hands of the Official Receiver.

Oxide Plant Dispute

Appeal Referred to Official Referee

AN appeal by Messrs. Keeling & Walker, Ltd., chemical manufacturers of Stoke-on-Trent, from a decision of an Official Referee in favour of the Sturtevant Engineering Co., Ltd., Queen Victoria Street, London (the CHEMICAL AGE, Nov. 20, 1920, page 563), came before Justices Avory and Salter in the King's Bench Divisional Court on Feb. 11.

Mr. Maddocks, K.C., for the appellants, explained that the action had been brought by his clients and was for damages for alleged breach of contract to supply and erect on the plaintiffs' premises an oxide recovery and cooling plant.

Plaintiffs' case was that the respondents had expressly guaranteed that their system would give zinc oxide at the rate of 250 lbs. of fume per hour, whereas in fact it did not prove capable of producing that amount. The Official Referee held that the contract between the parties was one for the sale of goods and that the terms printed on the tender form were part of the contract and he accordingly give judgment for the defendants. His (counsel's) contention for the appellants was that the contract was for work, labour and materials, and that the words on the tender form were no part of the contract.

Mr. Justice Avory said there were matters still open upon which the Official Referee should give a decision and, although they regretted having to take that course, the Court would send the case back to him to deal with.

Dyers' Wage Award

Workers' Application Fails

MR. J. A. Compston, K.C., the independent chairman and umpire in the arbitration between the National Society of Dyers, Finishers and Textile Workers and the Allied Association of Bleachers, Dyers, Printers and Finishers, has delivered an award, the arbitrators having failed to agree.

Mr. Compston states that, having regard to the protection afforded to the workmen in regard to the increased cost of living by the sliding scale, they have not made out a case for an advance on current rates, nor for a present minimum rate of £5 for 48 hours in the case of adult males or £3 for adult females. Piece workers are entitled to 25 per cent. higher earnings over the day workers.

Consideration cannot be given to an agreement for a shorter working week, with a view to limiting the hours to 48, without at the same time entering into the larger question of unemployment and under-employment, which was not referred to the arbitrators. Payment for holidays should not be imposed on employers, as it also is an element in this larger question.

Mr. Compston urges on the employers the desirability of settling with the workmen without delay a scheme embracing matters affecting unemployment and under-employment.

Six months ago, when the claims were first made, the employers asked the unions to withdraw their application so as to permit of the immediate adoption of an adequate and comprehensive scheme to deal with unemployment, under-employment and sickness on a joint contributory basis. The representatives of the unions, however, declined to delay their claim for higher wages.

Discovery of Synthetic Rubber

An Unfounded German Claim

ON February 10th, under the auspices of the Birmingham and Midland Section of the Society of Chemical Industry and the Chemical Society of the Birmingham University, Dr. Brownsden presiding, Mr. B. J. Eaton, O.B.E., F.I.C., read his paper on "Plantation Rubber," a summary of which was published in THE CHEMICAL AGE, page 158, February 5.

In the course of a discussion, Professor Morgan said it was peculiarly appropriate that such a lecture should have been delivered in Birmingham, one of the largest of the English centres engaged in the manufacture of rubber, but it was also appropriate that it should have been given in the University because 28 years ago Sir William Tilden there synthenised rubber. He it was who first produced synthetic rubber by isoprene treated with hydrochloric acid. That was denied in 1912 by the German chemists who made claim to the discovery, but the fact he mentioned was one of absolutely historical accuracy and deserved to be better known.

The Dyestuffs Act

Full List of Advisory Committee

In accordance with the provisions of Subsection (3) of Section 2 of the Dyestuffs (Import Regulation) Act, 1920, the President of the Board of Trade has appointed the following Committee to advise the Board of Trade with respect to the granting of licences under the Act.

Mr. Vernon Clay (Joint Managing Director, Robert Clay, Ltd.).
Mr. George Welsh Currie.
Mr. George Douglas (Managing Director, Bradford Dyers' Association, Ltd.).
Mr. E. V. Evans, O.B.E., F.I.C. (Treasurer of the Society of Chemical Industry).
Dr. Martin Onslow Forster, F.R.S., F.I.C. (Director of the Salter Institute of Industrial Chemistry).
Mr. C. C. Railton (Director, Calico Printers' Association, Ltd.).
Mr. H. B. Shackleton (Messrs. Taylor, Shackleton & Co., Shipley).
Mr. Thomas Taylor (Cornbrook Chemical Company, Stockport).
Mr. S. A. H. Whetmore (British Dyestuffs Corporation, Ltd.).
Mr. W. J. U. Woolcock, C.B.E., M.P. (General Manager, Association of British Chemical Manufacturers).

Pending the appointment of a permanent chairman, which it is hoped to make at an early date, Mr. Percy Ashley, C.B., Assistant Secretary, Industries and Manufactures Department, Board of Trade, will act as Chairman of the Committee. The Secretary to the Committee is Mr. W. Graham, M.B.E., and all applications for licences should be addressed to the Secretary, Dyestuffs Advisory Licensing Committee, Danlee Buildings, Spring Gardens, Manchester.

Chemical Warfare

Lord Haldane on the Dyestuffs Bill

At King's College on Monday afternoon, Viscount Haldane presiding, Professor Allmand delivered a lecture on "Chemical Warfare," in which he dealt with the use of poison gas during the recent war. He was glad to see the Government had granted some protection to our dye industries, as it was essential that we should be in a position to provide chemical weapons quickly in the event of another war.

At the conclusion of the lecture, Lord Haldane said he had not the faith in the Dyestuffs Bill to enable us to be prepared to turn out gases for the next war which the lecturer had. It was, no doubt, good to be provided with a sheltering wall behind which to prepare, but his experience of such walls was that those so protected were inclined to lay down in the shelter and not to work. He thought two things had emerged from Professor Allmand's lecture. The first was that we were not quite the "muddlers through" that we regarded ourselves as being. He instanced mustard gas, by far the most effective gas used in shells during the war. A German, Professor Myer, had recorded the discovery and effects of this gas long before the war, but the Germans appeared to have forgotten it, and only rediscovered it about two years after they first used gas. On the other hand, within twenty-four hours of our men of science being told of the effects of the new German gas they had run it to earth as Professor Myer's mustard gas. The second thing which emerged from the lecture was thedanger of trying to economise on education. To pinch the university colleges at this stage would be absolutely fatal.

Explosion at Chemical Works

Coroner's Inquiry Adjourned

Following the explosion at the chemical works of Messrs. Bowdler & Bickerdike, Oswaldtwistle, two more of the injured men have succumbed to their injuries.

On February 11 at the Accrington Town Hall, Mr. D. N. Haslewood, the East Lancashire Coroner, opened an inquiry which was adjourned until March 15, so that the necessary notice might be given to the Inspector of Explosives.

Mr. Holden, on behalf of the firm, expressed their sympathy with the relatives of the deceased men. Their relations, he said, with their workpeople had always been of the most harmonious character, and they desired him to say at the outset that the fullest information would be given by them with regard to the cause of the explosion.

Mr. Booth, representing the families of the deceased men, said it would be advisable that an independent analysis be made of the substance that was being used at the time.

To this the Coroner agreed, but stated that he thought the Inspector of Explosives would attend at the adjourned inquiry, and he thought that the Inspector would take good care to obtain an independent analysis of the chemicals used. The Coroner decided to hand over two samples of the chemical to the police, and to communicate with the Inspector of Explosives as to what action he had taken. If the Inspector decided that it did not come within the province of his duties he would have an analysis made by the county analyst.

Price of Soda Crystals

At Cardiff Police Court on February 9, before the Stipendiary Magistrate, Thomas Morgan, of 281, Gladstone Road, Barry, was summoned under the Profiteering Act, 1919, for having sold soda on April 9 last to Collins Brothers, Ltd., Shamrock Works, Cardiff, and to Sidney Cohen, John Bull Stores, Bridge Street, Cardiff, at a price which was unreasonable in view of the circumstances.

Mr. A. C. David appeared on behalf of the Board of Trade, Mr. Harold Lloyd defended, and Mr. W. G. Garner represented a party not named. Mr. Lloyd pleaded not guilty.

Mr. David explained that in April last Brunner, Mond & Co. sold 5 tons of soda to Morris Goldberg at £5 10s. a ton. The latter disposed of 4 tons to the defendant Morgan at £6 10s. a ton. Morgan in turn sold 3 tons of the soda through his agent Cohen to Messrs. Collins at a price of £9 a ton, thereby making a profit of £2 10s. a ton, which the Board of Trade considered was unreasonable. Messrs. Collins subsequently sold the soda at a very much higher price, and were prosecuted at the North London Police Court. The Board of Trade were of opinion that an unreasonable margin of profit—it worked out at 23 per cent.—had been made, and asked for a conviction.

Mr. Lloyd contended that the market price of the commodity should be taken into consideration—it was a guide. The grocers at that time were selling soda at 1½d. per lb., which worked out at £14 a ton.

The magistrate, without calling for any evidence, said he thought justice would be met if the defendant paid the whole of the costs.

Non-Delivery of Glue

In the King's Bench Division on February 17, Mr. Justice Rowlatt heard an action brought by Godfrey Phillips & Bros., Water Lane, Great Tower Street, against Charles W. Smallbone, Manor Ironworks, Walworth, for damages for non-delivery of 17 tons of air screw glue.

Plaintiffs' case was that they bought the glue from defendant on December 24, 1919, at £105 a ton, for re-sale. Delivery was to be immediate. They re-sold to Messrs. Murray & Co. for £112 10s. a ton and Messrs. Murray re-sold for £145 a ton. The glue was to be obtained from the Government but the Government would not sell by private contract and offered the glue by public tender, and,in the result,the transaction between plaintiffs and defendant fell through. Plaintiffs tendered at £100, but did not get the glue and Messrs. Murray tendered at £120 with a similar result. Plaintiffs had the amount of the cheque they paid defendant for the glue returned, but they claimed that they were entitled as damages to the amount of the difference between the contract price and £112 10s. a ton, and also to the difference between that price and the price at which Messrs. Murray sold at.

Mr. Disturnal, K.C., for the defendant, said the usual measure of damages was the difference between the contract price and the market price, when there was a market for the goods. But plaintiffs were not entitled to that because the evidence showed that there was no such thing as a market for the material which formed the subject-matter of the contract. Plaintiffs were only entitled to the difference between the contract price and their selling price to Messrs. Murray, a total of £172.

Mr. Justice Rowlatt gave judgment for plaintiffs for £512 10s.

From Week to Week

An agitation is proceeding amongst the CHILEAN NITRATE WORKERS for the socialisation of the industry.

DAMAGE amounting to over £20,000 was caused by a fire at the Pandy Leather & Cloth Factory, Dolgelley, on February 9.

It is announced that Sir CHARLES PARSONS will shortly join the board of Ross, Ltd., optical and scientific instrument manufacturers.

The Werrawerke Aktien Gesellschaft, Eisenach, Germany, has received official sanction for the ERECTION OF A SODA PLANT in the Wena valley.

Damage to the extent of about £500 was caused on February 10 by a fire in the BENZOL DISTILLERY PLANT shed of the National Tar Factory, Barrhead.

We regret that in our report last week of Mr. F. J. Broadbent's lecture on "The Driving of Centrifuges" the author was inadvertently described as "Dr."

The American Senate has passed a Bill creating a GOVERNMENT CORPORATION with a capital of 12,500,000 dollars to operate the Muscle Shoals and other Federal nitrate plants.

It is reported that HERR HUGO STINNES, the German magnate, has acquired the Königsberg Cellulose Co. and the North German Cellulose Co., which are to be incorporated with the Koholyt Co.

The United States Forest Products Laboratory reports that softwood TIMBER MILL WASTE can be made to yield 20 gallons or more of 95 per cent. alcohol per ton. The yield for hardwood waste is about half as much.

The manufacture of SYNTHETIC RUBBER has been abandoned by the Farbenfabriken, of Leverkusen, Germany, owing chiefly to the high cost of raw material, which makes it impossible to compete with natural rubber.

BRITISH SALT PRODUCERS state that owing to Spanish and German competition a number of salt works have been compelled to close down. German salt is being sold at less than a third of the cost of British salt.

Experiments in the manufacture of VANILIN FROM PIMENTO LEAVES are being carried out by the Jamaican Department of Agriculture. Analysis of a trial shipment of the oil shows that it contained a higher percentage of eugenol than of clove oil.

The present state of trade in the JUTE INDUSTRY has caused the Dundee Association of Jute Spinners and Manufacturers to make representations to the Minister of Labour that the industry should be withdrawn from the operations of the Trades Board Act.

The American War Department realised $3,703,586.66 on SURPLUS CHEMICALS, ACIDS AND EXPLOSIVES sold prior to January 1 this year. This does not include chemicals, acids and explosives transferred or sold to Government Departments or agencies.

Mr. R. SUSCHSLAND, for over fifty years chief chemist at the works of Messrs. Vivian & Sons, has passed away at his residence, Sketty Road, Swansea, at an advanced age. Mr. Suschsland was a man of high capabilities in the chemical world, and held an excellent reputation as an analytical chemist.

According to figures furnished by the GERMAN POTASH SYNDICATE, the sales of potash salts in 1919 reached a total of 4,159,227 metric tons with 812,002 tons of potash. In 1918 the sales amounted to 4,840,934 tons of potash salts with 1,001,664 tons of potash.

A new company has been formed in Florence under the auspices of the Credito Italiano for the production of CHEMICALS AND PHARMACEUTICAL PRODUCTS. The company which has a capital of 8,000,000 lire has been registered under the style of Societa Anonima Italo-Britannica L. Manetti H. Roberts & Co.

THE PATENT FUEL TRADE is so depressed that for the first time in its history not a single ton of the fuel was shipped last week from Swansea. The Phœnix Patent Fuel Works, Swansea, however, re-started operations on Tuesday on a forty-four hour week system, thus providing employment for three hundred men.

Mr. J. T. BARING has entered into partnership with Messrs. Williams & Pell, of 5, Chancery Lane, London, W.C.2., agents for The Electrical Alloy Company, The Industrial Filtration Corporation, La Métallurgique Electrique and The British Electric Plant Co., Ltd. The business will from now be carried on under the style of Williams, Pell & Baring at the same address.

Colour manufacturers and consumers at Milan have entered into a contract with the Italian Government whereby they may purchase the stocks of DYESTUFFS and INTERMEDIATES FURNISHED BY GERMANY under the terms of the Peace Treaty. In addition to receiving a bank guarantee of 9 million francs, the State claims the right to fix sales prices while the manufacturers declare their readiness to bear the administration expenses.

The RESEARCH ASSOCIATION FOR THE CAST IRON AND ALLIED INDUSTRIES has been approved by the Department of Scientific and Industrial Research as complying with the conditions laid down in the Government scheme for the encouragement of industrial research. The secretary of the committee for the establishment of this association is Mr. Thomas Vickers, 174, Corporation Street, Birmingham.

In future meetings of the Manchester Section of the SOCIETY OF CHEMICAL INDUSTRY will be held at the Textile Institute, 16, St. Mary's Parsonage, Manchester. At the next meeting on March 4, the following papers will be read: "Column Apparatus for the Chemical Industry," by S. J. Tungay, and "Normal Amyl Benzene and some of Its Derivatives," by L. Guy Radcliffe and N. Simpkin. At the meeting on April 1 a paper entitled "Sulphuric Acid during the War Period," by H. J. Bailey, O.B.E., F.I.C., takes the place of those previously announced.

In explaining the reasons for the recent appointment of two German chemists by the Du Pont Company (referred to in THE CHEMICAL AGE of January 29), Dr. R. E. Rose states that the United States Dyestuffs industry is equipped to produce 85 per cent. of the dyes required for American consumption and that the remaining 15 per cent. can be made if time is allowed to develop special processes. This period he fixes at from three to five years. German chemists, he states, are employed by the Du Pont Co., not because American chemists fear their inability to solve the necessary special processes, but because the company sees in foreign help a short cut to the discovery of the remaining formulæ and practice required.

The Fine Chemical Industry

Visit to British Drug Houses' Works

ON Monday, at the invitation of British Drug Houses, Ltd., a visit of inspection was paid to the works of the company in Graham-street, City-road, London, on the Regent's Canal, and much was heard of the vital importance of maintaining and extending the fine chemicals industry in this country.

Mr. C. A. Hill, managing director, said that the progress of the British fine chemical industry hung fire because of the uncertainty that the Government showed in the matter of redeeming pledges given during the war, when a certain measure of protection was relied on in order to enable the industry to become stabilised. The fact was that the fine chemical industry was essential to the making of war and to protection against attack, and one could not mention a single industry that could be fostered without it. They wanted to invest capital, but they needed protection for it, and what they asked was a few years of breathing space secured by protection against German importation. Of course capital, and works, and everything could be scrapped. That would be serious, but not nearly so serious as the industry being ousted and its products supplanted by fine chemicals from Germany, which would be essential in another war.

Mr. W. J. Woolcock, M.P., Assistant Director of Army Supplies during the war, said that nothing was demanded of British chemists that they could not supply in face of great difficulties. At the end of the war we had a better poison gas at our service than had been used, and a better one would be available at the beginning of the next war.

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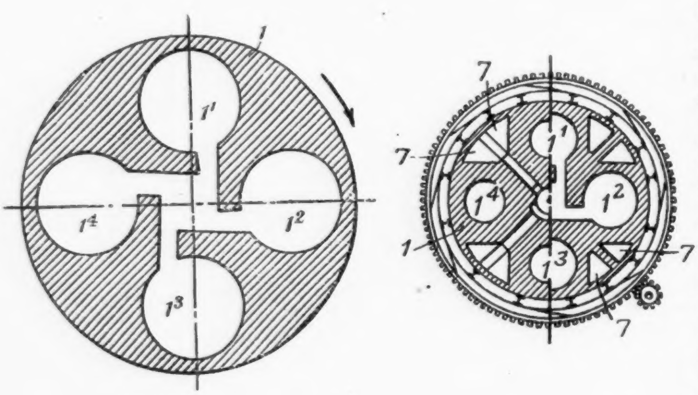
Patent Literature

Abstracts of Complete Specifications

156,835. ROTARY FURNACES. F. Derneden, 122, Boulevard Audent, Charleroi, Belgium. Application date, June 26, 1919.

The furnace is of the rotary type for carrying out operations such as drying, roasting, calcining or effecting various chemical reactions, and the object is to extend the time of passage of the material through the furnace without extension of the length or excessive slowness of rotation. A solid cylinder 1 is provided with four small cylindrical channels 1^1, 1^2, 1^3, 1^4, arranged symmetrically about the axis. If the cylinder rotates in the direction shown by the arrow any material in the channel 1^1 will pass through the connecting passage into the cylinder 1^2 and will then pass round the walls of the cylinder until it is transferred into the cylinder 1^3 and so on. If each of the cylinders is divided into equal compartments throughout its length by transverse vertical partitions, and the communi-



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cating passages are so arranged that the first compartment of 1^1 communicates with the first compartment of 1^2 and the latter with the first compartment of 1^3, &c., and the last compartment of the series is in communication with the second compartment of 1^1 it follows that the furnace must make three complete revolutions before the material has advanced one compartment. In practice it is not necessary to provide partitions in the cylinders, but the same effect is produced if the opening of the communicating passages is made along a helical curve. Intermediate channels may be formed for the passage of heating gas. In a furnace of this type the material passes through the cylinders 1^1, 1^2, 1^3, 1^4, and the gas from a producer passes along the channels 7 towards the delivery end of the furnace and returns by channels 9. The speed of advancement of the material is inversely proportional to the number of sub-divisional channels and also varies according to the inclination of the connecting passages.

156,852. PULVERISING APPARATUS. W. L. McLaughlin, Decatur, Ill., U.S.A. Application date, August 28, 1919.

The pulverising apparatus is for reducing material to an impalpable powder, and is used for example in reducing coal to a powder which will burn in the same manner as gas. A rotating horizontal drum contains a number of loose pulverising rods or rollers of varying diameter, so that the interstices between those of larger diameter are practically filled by those of smaller diameter, and the spaces are reduced to a minimum. Compressed air is introduced into the drum in a number of jets extending the length of the drum to agitate the material and to suspend the finest particles in the air. The air carrying those particles is drawn out of the apparatus by a weak suction. The material is supplied to the drum through a pipe extending axially through the drum and provided with a helical conveyor and a helical discharge slot.

156,866. METAL-BEARING ORES OR OTHER METAL-BEARING MATERIALS, TREATMENT OF—AND THE RECOVERY OF VALUABLE OR DESIRED CONSTITUENTS. E. A. Ashcroft, 65, London Wall, London. Application date, September 30, 1919.

The process is more particularly applicable to the extraction of the non-ferrous metals and the recovery of sulphur from all classes of sulphide ores or concentration products, more especially complex ores, concentrates, middlings, tailings, slimes, &c., such as the concentrates from Broken Hill deposits or the natural "Burma Corporation ore." The ore is suspended in a fused melt in a converter and treated with chlorine, the melt consisting of anhydrous magnesium chloride or calcium chloride or fused sodium or potassium chloride. Any iron or manganese present in the ores is preferably converted into oxide by precipitating with magnesia, lime, soda or potash. Silver, lead, and zinc are fractionally precipitated from the mixture of chlorides in the converter by adding suitable proportions of metallic alloys consisting of lead or zinc with magnesium, sodium or potassium. Any gold present is precipitated with the silver and recovered by known methods. The precipitating metal is converted into chloride. Alternatively the heavy metals may all be precipitated together and separated from the resulting alloy. The gangue and precipitated oxide may be removed before precipitation, leaving the added chloride and the chlorides of the heavy non-ferrous metals, or after precipitation leaving pure anhydrous magnesium, calcium, sodium, or potassium chloride. The removal is effected by filtration through charcoal, which occurs very rapidly owing to the low viscosity of the chlorides. Alternatively the melt may be dissolved in water and filtered. The fused chlorides are then electrolysed, using zinc or lead cathodes, for the recovery of metallic magnesium, calcium, sodium or potassium as described in Specification 152,402 (*see* THE CHEMICAL AGE, Vol. III., page 567). The chlorine obtained may be passed into the converters; the sulphur may be obtained pure if air is excluded, or as sulphur dioxide if air is admitted, or as sulphuryl chloride, using an excess of chlorine at a low temperature. The process is thus cyclic and is found to be very economical.

156,892. THORIUM COMPOUNDS, MANUFACTURE OF INSOLUBLE. H. Wade, London. (From Lindsay Light Co., 161, East Grand Avenue, Chicago, Ill., U.S.A.). Application date, October 11, 1919.

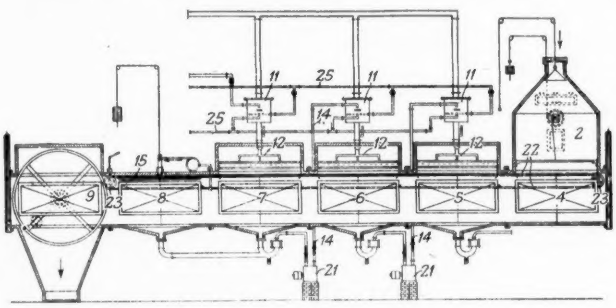
Thorium sulphate is dissolved in hot 80 per cent. syrupy orthophosphoric acid and the solution heated for some time to 280°C., yielding white crystals of $Th(PO_3)_2SO_4$ which is insoluble in water and in dilute acid. The same compound may be produced by the reaction of thorium phosphate and a mixture of concentrated sulphuric acid and phosphoric acid. Reference is directed in pursuance of Section 7, sub-section 4, of the Patents and Designs Acts, 1907 and 1919, to Specifications 112,380 and 117,438.

156,896. PHENOL-ALDEHYDE CONDENSATION PRODUCTS, SOLUTIONS OF. G. H. Howse, 34, Vicarage Road, Smethwick, Birmingham. Application date, October 13, 1919.

The object is to obtain solutions of phenol aldehyde condensation products for use in the production of varnishes, lacquers, paints, cements and insulating materials. The solvent for the condensation product consists of benzyl alcohol with or without nitrobenzene, aliphatic oxygen compounds (ketones or methylated spirit), xylol, benzene, nitro-naphthalenes, chlor-naphthalene, aromatic acids or their salts or esters, *e.g.*, benzene sulphonic acid, naphthalene sulphonic acid, aliphatic hydrocarbons or their halogen compounds, bitumen, pitches, nitrated or sulphonated fatty acids or oils, unsaturated fatty acids, linseed oil, tung oil, fish oils, lumbang or perilla oils, resins, gums, drying oils, shellac, rubber, waxes, cellulose, nitrocellulose, dyes, casein, pigments, or fillers.

156,905. FAT OR OIL FROM RAW MATERIALS, EXTRACTION OF. H. Bollmann, 17, Mönckebergstrasse, Hamburg, Germany. Application date, October 14, 1919.

The apparatus is for extracting fat or oil by the action of a solvent on the counter current principle. The material is fed from a hopper, 2, into perforated open receptacles, 4, 5, 6, 7, 8, 9, supported by endless chains, 22. The solvent is supplied by a pipe, 10, to a receptacle, 11, heated by steam pipes, 25, and passes thence to a spraying device, 12, and thence through the material in the receptacle, 7. The solvent and oil, &c., are then passed to a receptacle, 13, and thence by pipe, 14, and pump, 21, to the next receptacle, 6, in the same manner. After traversing the series, the solvent is treated for the re-



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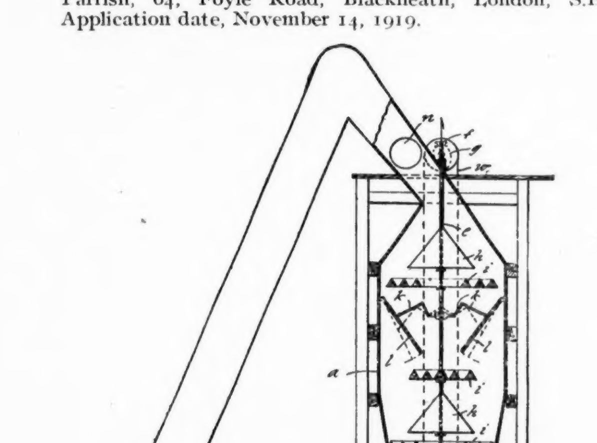
covery of the oil, &c., and returned to the apparatus. The receptacle, 8, containing spent material, is closed by a plate, 15, and the remaining solvent removed by compressed air. The material in the receptacle 9, is discharged. In a modification the receptacles containing raw material are moved through the closed chamber in two columns, one moving upwards and the other downwards, while the solvent is sprayed on to the top of each column so that it passes through one column in the same direction as the material and through the other column in the opposite direction.

156,963. SALTS, MEANS FOR DRYING. South Metropolitan Gas Co., 709, Old Kent Road, London, S.E. 15, and P. Parrish, 64, Foyle Road, Blackheath, London, S.E. Application date, November 14, 1919.



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The powered salt, *e.g.*, ammonium sulphate, is dried by causing it to fall through a tower against a current of hot gases. The material is raised by an elevator, *p*, and falls on a cone, *h*, carried by a rod, *e*, which is reciprocated vertically by a cam, *g*, so as to impart a periodic concussion to the cone, *h*, and distribute the material over a grid, *i*. The material then falls on to flaps, *l*, which are reciprocated by the rod, *e*, through levers, *k*, and then on to a second cone, *h*, and other grids, *i*, also carried by the rod, *e*. Hot air is supplied by the pipe, *m*, and passes upwards through the tower, *a*. An efficient distribution and drying of the material are thus obtained and the dried crystals are carried by a conveyor, *b*, to crushing rolls, *c*, which discharge to a conveyor, *d*. In a modification the cones, *h*, and grids, *i*, are fixed, and fixed plates are substituted for the flaps, *l*, while the whole tower is vibrated by external blows.

156,916. ACETIC ACID, MANUFACTURE OF. H. Dreyfus, 8, Waterloo Place, London, S.W. 1. Application date, October 17, 1919.

The process is for manufacturing acetic acid by oxidising acetaldehyde with oxygen or air in the presence of ferric oxide as a contact substance. When liquid aldehyde is used the reaction is accelerated if the ferric oxide is prepared by precipitation from a ferric salt solution, and then heated to 400°-500°C. A quantitative yield of glacial acetic acid may be obtained by this process.

157,030. PHTHALEINS, MANUFACTURE OF. O. Imray, London. (From Monsanto Chemical Works, 1800, S. Second Street, St. Louis, Mo., U.S.A.) Application date, May 31, 1920.

When phthalic anhydride is condensed with phenols, it is usually necessary to employ dehydrating agents such as concentrated sulphuric acid, anhydrous zinc chloride, or stannic chloride. Water is formed during the condensation process thus retarding the reaction, and in addition tarry by-products are formed, and a subsidiary orthocondensation occurs. These disadvantages are now avoided by using an anhydrous sulphonic acid of an aromatic hydrocarbon as condensing agent, and the reaction may be carried to substantial completion. In the production of phenolphthalein from phthalic anhydride and phenol the two are heated to about 80°C., and the acid preferably a toluene sulphonic acid is added, and the mixture kept at about 120°C. for 10-12 hours. The crude phenolphthalein is washed with water, dissolved in caustic soda, filtered, precipitated with acid, and recrystallised from alcohol. The action of the anhydrous sulphonic acid is increased by adding anhydrous zinc chloride when zinc toluene sulphonate and hydrochloric acid are produced, and the latter distils off with the water.

NOTE.—The following specifications which are now accepted were abstracted in THE CHEMICAL AGE when they became open to inspection under the International Convention: 141,352 (E. Assie), relating to electric furnaces, *see* Vol. II., p. 670; 144,656 (Aktiebolaget Kvafveindustri), relating to chemical reactions in electric furnaces, *see* Vol. III., p. 213.

International Specifications not yet Accepted

155,226. TAR OR PITCH, DISTILLING. Barrett Co., 17, Battery Place, New York. (Assignees of R. P. Perry, Upper Montclair, N.J., U.S.A.). International Convention date, December 10, 1919.

Pitch having a high melting point, and which does not foam when coked, is obtained by distilling coal tar or pitch, coke-oven tar, water-gas tar, &c., in a current of nitrogen, carbon dioxide, carbon monoxide, or other inert gas. The pitch may then be coked at or above 700°F.

155,240. ROTARY KILNS. American Metal Co., 61, Broadway, Manhattan, New York. (Assignees of A. B. Carstens, Box 137, Monterrey, Mexico.) International Convention date, December 8, 1919.

A horizontal kiln rotates just above a bin containing the material to be treated, and is provided with a number of large scoops projecting outwards from the periphery, so as to pick up the material during rotation. The material is delivered from the scoop into the kiln through a valve composed of a pair of flaps which are opened at the delivery point by the engagement of an arm on the valve, with a fixed cam carried by the frame.

155,246. IRON ORES CONTAINING NICKEL, TREATING. Moa Iron and Development Corporation, 2, Rector Street, New York. (Assignees of C. R. Haywood, Quincy, Mass, U.S.A.; H. M. Schleicher, Boston, Mass., U.S.A.; and F. O. Stillmann, Melrose, Mass., U.S.A.) International Convention date, December 8, 1919.

Iron ores containing oxides or oxides and silicates of iron and aluminium, and also small quantities of nickel, manganese and chromium are dried, preheated, and then sulphatised by roasting in contact with sulphur dioxide. The mixture is then leached with water to extract the aluminium and other metals as sulphates, and leave the purified iron ore. The solution is treated with iron or sulphur dioxide to precipitate some of the iron in solution, and calcium chloride is then added, and the resulting calcium sulphate filtered off from the solution of chlorides. Aluminium hydrate, ferric hydrate, and chromium hydrate are then precipitated by adding the correct amount of calcium carbonate, and the precipitate is subjected to Bayer's process to separate the aluminium. The iron remaining in the solution is precipitated as ferric hydrate by treating with air and calcium carbonate, and filtered off, and nickel and manganese hydrates are precipitated from the solution by adding lime. The mixed precipitate is dissolved in sulphuric acid, and the solution electrolysed with a nickel cathode and insoluble anode to obtain metallic nickel and manganese dioxide. Further details are given.

155,259. THIOPHENE DERIVATIVES. H. Scheibler, 14, Hortensienstrasse, Lichterfelde, near Berlin. International Convention date, April 28, 1914.

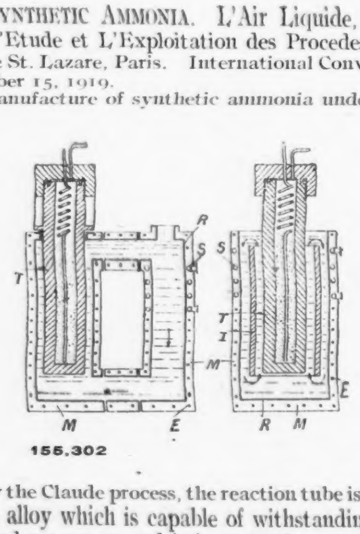
Bituminous rock oils rich in sulphur are refluxed with caustic alkali, soda lime or other mixture of alkali and alkaline earth hydroxides, and the product washed with dilute acid, dried, and distilled *in vacuo*. Any remaining oxygen compounds are removed by treating with an ethereal solution of an alkyl magnesium halide, evaporating off the ether, and treating the residue with acid, and then with alkali. The mixture is then distilled over sodium, yielding colourless oils having medicinal properties. Thiophene derivatives in these oils may be isolated by treating with mercury salts, and decomposing the resulting double salts, or by halogenating and distilling, or by treating with cold acetyl chloride and aluminium chloride, yielding acetyl derivatives. The semicarbazone of propyl acetylthiophene can be obtained.

155,299. ZIRCONIUM. W. North and H. Loosli, 32, Schillerstrasse, Hanover, Germany. International Convention date, November 14, 1919.

Zirconium oxide is mixed with the theoretical amount of carbon, and reduced by heating in an electric furnace under increased pressure, the current being passed through the charge, or through a carbon core.

155,302. SYNTHETIC AMMONIA. L'Air Liquide, Soc. Anon. pour L'Etude et L'Exploitation des Procedes G. Claude, 48, Rue St. Lazare, Paris. International Convention date, December 15, 1919.

In the manufacture of synthetic ammonia under very high



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pressures by the Claude process, the reaction tube is constructed of a special alloy which is capable of withstanding high temperatures and pressures, and is inert to the gases. The tube is immersed in a liquid such as sulphur containing a small quantity of phosphorus pentasulphide which boils at about the reaction temperature, and the heat of the reaction is thereby removed. The lower part of the containing vessel is heat-insulated, and the vapour generated is condensed on the upper non-insulated portion. In a modification, the reaction tube, *T*, is immersed in a non-boiling liquid such as molten lead or tin, in one leg of a thermo-siphon, *R*, the other leg of which is cooled by pipes, *S*. The metal is initially melted by electric heating means, *E*. In another modification, the thermo-siphon may be formed by an open ended tube, *I*, of heat-insulating material, the outer tube being cooled at the upper end by pipes, *S*.

LATEST NOTIFICATIONS.

158,533. Manufacture of borneol. Fabriques De Produits Chimiques De Thann et De Mulhouse. February 4, 1920.

158,540. Process for the manufacture of explosives and primers. Rathsburg, H. February 3, 1920.

158,503. Work support for machines for treating hides and leather. Maschinenfabrik Turner Akt.-Ges. January 31, 1920.

158,512. Method for the Production of condensation products. Elecktrochemische Werke Ges., Bosshard, H., and Strauss, D. August 9, 1918.

158,250. Method and device for carrying out electro-chemical gas reactions. Elektrosynthese Ges. July 19, 1917.

158,252. Treatment of tar oils and the like. Otto, O. T. January 17, 1920.

158,269. Rotary valves. Dennison, F. R. January 21, 1920.

158,279. Methods of and apparatus for mixing or masticating rubber and the like. Farrel Foundry Co. January 13, 1919.

158,513. Process for the dry distillation and coking of raw peat and the like. Torfverwertungsges, Dr. Pohl and Von Derwitz. January 22, 1920.

Specifications Accepted, with Date of Application.

141,758. Hydrogen peroxide, Processes for the production of. Soc. l'Air Liquide. May 11, 1914.

143,193. Transformer oil, Process for the manufacture of. M. Melamid. May 15, 1919.

145,035. Cupric ammonia cellulose solutions for spinning artificial thread or the like, Process for preparing durable. Glanzfaden Akt.-Ges. October 12, 1917.

145,582 and 146,259. Fertilisers, Manufacture of artificial. Akt.-Ges. Anilin Fabrikation. March 16 and January 29, 1918.

146,919. Aluminium nitride, Production of—by electrically-generated heat. Armour Fertilizer Works. July 10, 1919.

158,002. Low and medium temperature carbonisation of coal, oil shale, wood, peat, and the like, Process for—and apparatus therefor. J. R. Garrow. July 31, 1918.

158,010. Iron, steel, and certain other metals, Method or process for coating—with aluminium. J. Thompson, Ltd., W. J. Thompson, and H. E. V. Partridge. July 25, 1919.

158,148. Electrolytic gas-generators. I. H. Levin. December 31, 1919.

158,152. Centrifugal driers. G. H. Elmore. February 9, 1920.

158,166. Furnace arches. P. J. O'Donnell. March 20, 1920.

Applications for Patents

Amalgamated Zinc (De Bavays), Ltd. Recovery of lead and silver from sulphide ores and metallurgical products. February 11. 4913. (Australia, February 13, 1920.)

Armour Fertilizer Works. Production of aluminium chloride. February 11. 4895. (United States, March 24, 1920.)

Atack, F. W. Condensation of *o*-benzoyl-benzoic acid or its derivatives. 4556. February 9.

Atack, F. W. Oxidation of hydrocarbons. 4557. February 9.

Bxler, W. Manufacture of acetic anhydride, &c. 4637. February 9.

Badische Anilin & Soda Fabrik. Manufacture of alcohol. February 9. 4634. (Germany, February 9, 1920.)

Barbet et Fils et Cie, E. Continuous rectification of liquid air, &c. February 11. 4898. (France, February 11, 1920.)

Barton, B. C. Strainers for controlling admission of high and low pressure liquid to hydraulic presses. 4685. February 10.

British Cellulose & Chemical Manufacturing Co., Ltd. Manufacture of acetic anhydrides, &c. 4637. February 9.

Chemical Engineering & Wilton's Patent Furnace Co., Ltd. Distillation of tar. 4902. February 11.

Cumberland Coal Power & Chemicals, Ltd. Production of hydrogen. 4642. February 9.

Deutsche Gold & Silber-Scheideanstalt vorm. Rössler. Manufacture of prussic acid. 4419. February 7.

Dreyfus, H. Manufacture of cellulose derivatives. 4639. Feb. 9.

Dumont, P. Discharge apparatus for lime kilns, &c. 4316. Feb. 7.

Dutt, P. C. Treatment and decolorization of vegetable oils and glycerine. 4613. February 9.

Gartlan, S. L. and Gooderham, E. A. Process for treatment of petroleum oils. 4496. February 8.

Gartlan, S. L. and Gooderham, E. A. Apparatus for treatment of petroleum oils. 4497. February 8.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to* THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.

Market Report

THURSDAY, February 17.

The market remains very uninteresting, and little business is reported. At the same time the standard of values is better maintained, and in some directions prices appear to have touched bottom. An improvement in the demand from the manufacturing North would quickly influence the general situation, and there appears reason to hope that such an improvement may be expected in the early spring.

There is no outstanding feature in the export business, except the pronounced absence of orders.

General Chemicals

ACETONE is still in good inquiry on export account.

ACID ACETIC.—A moderate volume of business is reported for early delivery at recent prices.

ACID CARBOLIC is a nominal market and continues to favour buyers.

ACID CITRIC is nominally unchanged in price, and conditions are still governed by the second-hand market.

ACID FORMIC is a weak market, and the demand is only nominal.

ACID OXALIC is in much better demand, and no further reduction in price has been indicated.

ACID TARTARIC.—Very little business is reported and the position remains easy.

BLEACHING POWDER is in very poor demand, and cheap offers are gain reported from the Continent.

COPPER SULPHATE is very slow, and an early improvement is hardly thought to be likely.

FORMALDEHYDE is only in limited demand, but nominally without change in price.

LEAD ACETATE is inclined to be a little firmer, but only a moderate business is passing.

LITHOPONE is in small inquiry and the tendency of price is in buyers' favour.

MAGNESIUM SALTS are featureless.

POTASH CARBONATE AND CAUSTIC.—No further business is reported and stocks are difficult to realise.

POTASH PRUSSIATE is not in such good demand and only small stocks appear to be available.

SALAMMONIAC continues on offer from the Continent, but the actual volume of business passing is apparently small.

SODIUM ACETATE has again been in good demand, but the price paid has been rather unsatisfactory.

SODIUM BICHROMATE has been offered on realisation again. The present price does not seem to be justified, and sooner or later the article must come into its own.

SODIUM CAUSTIC remains easy owing to the continued absence of demand.

SODIUM HYPOSULPHITE is nominally unchanged, but the tendency is easier.

SODIUM NITRITE.—The improved tone has been maintained, although the volume of business is very small.

SODIUM PRUSSIATE remains a weak market and orders are few and far between.

Coal Tar Products

There is little change to report in our market since last week.

90's BENZOL is fairly steady at 2s. 9d. to 2s. 10d. on rails in the North, and 2s. 10d. to 2s. 11d. in the South.

PURE BENZOL is weak, and is quoted from 2s. 9d. to 3s. per gallon.

CREOSOTE OIL is fairly active for prompt business, and is quoted at 11½d. to 1s. in the North, and 1s. 1d. to 1s. 2d. in the South.

CRESYLIC ACID is dull, at 2s. 9d. to 3s. for the Pale quality 97/99 per cent., while Dark 95/97 per cent. is worth from 2s. 6d. to 2s. 9d.

SOLVENT NAPHTHA is inactive at 2s. 4d. on rails.

HEAVY NAPHTHA is worth from 2s. 6d. to 2s. 9d.

NAPHTHALENE has practically no inquiry, the Crude quality being worth about £8 10s. to £14 per ton, and Refined from £24 to £26 per ton.

Coal Tar Intermediates

Trade continues on the slow side, although there are slight signs here and there of a revival in interest.

ALPHA NAPHTHYLAMINE is in slow demand, and the price is without change.

ANILINE OIL AND SALT.—There is very little business to report, and export trade is practically at a standstill.

BETA NAPHTHOL is steadier, and stocks in second hands are being slowly absorbed.

DIMETHYANILINE is inclined to be easy in the absence of any considerable demand.

NITRO BENZOL is steady with a fair trade passing.

PARANITRANILINE is only in small demand, and the price is without change.

SALICYLIC ACID is lifeless, and the price continues to be in buyers' favour.

Current Prices

Chemicals

	per	£	s.	d.		£	s.	d.
Acetic anhydride	lb.	0	2	6	to	0	2	9
Acetone oil	ton	90	0	0	to	95	0	0
Acetone, pure	ton	100	0	0	to	105	0	0
Acid, Acetic, glacial, 99-100%	ton	70	0	0	to	72	0	0
Acetic, 80% pure	ton	53	0	0	to	54	0	0
Arsenic	ton	100	0	0	to	105	0	0
Boric, cryst.	ton	72	10	0	to	74	0	0
Carbolic, cryst. 39-40%	lb.	0	0	9	to	0	0	9½
Citric	lb.	0	2	4	to	0	2	6
Formic, 80%	ton	80	0	0	to	85	0	0
Gallic, pure	lb.	0	4	9	to	0	5	0
Hydrofluoric	lb.	0	0	8½	to	0	0	9
Lactic, 50 vol.	ton	42	10	0	to	43	10	0
Lactic, 60 vol.	ton	47	10	0	to	50	0	0
Nitric, 80 Tw.	ton	41	0	0	to	44	0	0
Oxalic	lb.	0	1	0	to	0	1	1
Phosphoric, 1.5	ton	65	0	0	to	67	0	0
Pyrogallic, cryst	lb.	0	10	6	to	0	10	9
Salicylic, Technical	lb.	0	1	6	to	0	1	8
Salicylic, B.P.	lb.	0	1	4	to	0	1	6
Sulphuric, 92-93%	ton	8	10	0	to	8	15	0
Tannic, commercial	lb.	0	3	6	to	0	3	9
Tartaric	lb.	0	1	11	to	0	2	0
Alum, lump	ton	18	0	0	to	18	10	0
Alum, chrome	ton	45	0	0	to	50	0	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	13	0	0	to	14	0	0
Aluminium, sulphate, 17-18%	ton	15	5	0	to	16	0	0
Ammonia, anhydrous.	lb.	0	2	2	to	0	2	4
Ammonia, .880	ton	43	0	0	to	45	0	0
Ammonia, .920	ton	30	0	0	to	32	10	0
Ammonia, carbonate	lb.	0	0	4	to		—	
Ammonia, chloride	ton	85	0	0	to	90	0	0
Ammonia, muriate (galvanisers)	ton	57	10	0	to	60	0	0
Ammonia, nitrate	ton	55	0	0	to	60	0	0
Ammonia, phosphate	ton	95	0	0	to	100	0	0
Ammonia, sulphocyanide	lb.	0	3	0	to	0	3	3
Amyl acetate	ton	420	0	0	to	425	0	0
Arsenic, white, powdered	ton	77	10	0	to	80	0	0
Barium, carbonate, 92-94%	ton	12	10	0	to	13	0	0
Barium, chlorate	lb.	0	0	11	to	0	1	0
Chloride	ton	21	0	0	to	23	0	0
Nitrate	ton	55	0	0	to	56	0	0
Barium Sulphate, blanc fixe, dry	ton	30	0	0	to	31	0	8
Sulphate, blanc fixe, pulp	ton	16	10	0	to	17	0	0
Sulphocyanide, 95%	lb.	0	1	6	to	0	1	0
Bleaching powder, 35-37%	ton	22	0	0	to	23	0	0
Borax crystals	ton	39	0	0	to	41	0	0
Calcium acetate, Brown	ton	15	0	0	to	17	0	0
,, Grey	ton	23	0	0	to	25	0	0

	per	£	s.	d.		£	s.	d.
Calcium Carbide	ton	29	0	0	to	30	0	0
Chloride	ton	12	10	0	to	13	0	0
Carbon bisulphide	ton	65	0	0	to	67	0	0
Casein, technical	ton	90	0	0	to	92	0	0
Cerium oxalate	lb.	0	3	9	to	0	4	0
Chromium acetate	lb.	0	1	2	to	0	1	4
Cobalt acetate	lb.	0	11	6	to	0	12	6
Oxide, black	lb.	0	16	0	to	0	16	6
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	39	0	0	to	40	0	0
Cream Tartar, 98-100%	ton	200	0	0	to	210	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol.	ton	130	0	0	to	135	0	0
Formusol (Rongalite)	lb.	0	4	9	to	0	5	1
Glauber salts	ton	Nominal.						
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	50	0	0	to	52	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	58	0	0	to	60	0	0
Carbonate (White Lead)	ton	47	0	0	to	50	0	0
Nitrate	ton	62	10	0	to	65	0	0
Litharge	ton	53	0	0	to	55	0	0
Lithopone, 30%	ton	37	10	0	to	40	0	0
Magnesium chloride	ton	15	10	0	to	16	10	0
Carbonate, light	cwt.	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial)	ton	12	10	0	to	13	0	0
Sulphate (Druggists')	ton	18	10	0	to	19	10	0
Manganese, Borate	ton	190	0	0	to	—		
Sulphate	ton	130	0	0	to	135	0	0
Methyl acetone	ton	95	0	0	to	100	0	0
Alcohol, 1% acetone	gall.	Nominal.						
Nickel sulphate, single salt	ton	60	0	0	to	62	0	0
Nickel ammonium sulphate, double salt	ton	62	0	0	to	64	0	0
Potassium bichromate	lb.	0	1	1	to	—		
Carbonate, 90%	ton	85	0	0	to	90	0	0
Chloride	ton	50	0	0	to	52	0	0
Chlorate	lb.	0	0	8½	to	0	0	9
Meta bisulphite, 50-52%	ton	290	0	0	to	205	0	0
Nitrate, refined	ton	63	0	0	to	65	0	0
Permanganate	lb.	0	2	6	to	0	2	9
Prussiate, red	lb.	0	2	6	to	0	2	9
Prussiate, yellow	lb.	0	1	6	to	0	1	7
Sulphate, 90%	ton	31	0	0	to	33	0	0
Salammoniac, firsts	cwt.	5	0	0	to	—		
Seconds	cwt.	4	15	0	to	—		
Sodium acetate	ton	45	0	0	to	47	10	0
Arsenate, 45%	ton	60	0	0	to	62	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	9½	to	0	0	10
Bisulphite, 60-62%	ton	37	10	0	to	40	0	0
Chlorate	lb.	0	0	5¼	to	0	0	5½
Caustic, 70%	ton	27	0	0	to	28	0	0
Caustic, 76%	ton	28	0	0	to	29	0	0
Hydrosulphite, powder, 85%	lb.	0	2	3	to	0	2	6
Hyposulphite, commercial	ton	26	0	0	to	27	0	0
Nitrite, 96-98%	ton	60	0	0	to	62	0	0
Phosphate, crystal	ton	32	0	0	to	35	0	0
Perborate	lb.	0	2	2	to	0	2	4
Prussiate	lb.	0	0	8½	to	0	0	9
Sulphide, crystals	ton	22	0	0	to	25	0	0
Sulphide, solid, 60-62%	ton	45	0	0	to	47	0	0
Sulphite, cryst.	ton	15	0	0	to	16	0	0
Strontium carbonate	ton	85	0	0	to	90	0	0
Strontium Nitrate	ton	90	0	0	to	95	0	0
Strontium Sulphate, white	ton	8	10	0	to	10	0	0
Sulphur chloride	ton	42	0	0	to	44	10	0
Sulphur, Flowers	ton	19	0	0	to	19	10	0
Roll	ton	19	0	0	to	19	10	0
Tartar emetic	lb.	0	2	6	to	0	2	9
Tin perchloride, 33%	lb.	0	2	6	to	0	2	7
Perchloride, solid	lb.	0	3	0	to	0	3	3
Protochloride (tin crystals)	lb.	0	2	0	to	0	2	1
Zinc chloride, 102 Tw.	ton	22	0	0	to	23	10	0
Chloride, solid, 96-98%	ton	60	0	0	to	65	0	0
Oxide, 99%	ton	45	0	0	to	47	10	0
Dust, 90%	ton	90	0	0	to	92	10	0
Sulphate	ton	21	10	0	to	23	10	0

Coal Tar Intermediates, &c.

	per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	4	0	to	0	4	3
Alphanaphthol, refined	lb.	0	4	6	to	0	4	9
Alphanaphthylamine	lb.	0	3	3	to	0	3	6
Aniline oil, drums extra	lb.	0	1	8	to	0	1	9
Aniline salts	lb.	0	1	10	to	0	2	0
Anthracene, 85-90%	lb.		—		to		—	
Benzaldehyde (free of chlorine)	lb.	0	5	3	to	0	5	6
Benzidine, base	lb.	0	11	6	to	0	12	0
Benzidine, sulphate	lb.	0	10	0	to	0	10	6
Benzoic acid	lb.	0	2	6	to	0	2	9
Benzoate of soda	lb.	0	2	3	to	0	2	6
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	0	9	6	to	0	10	0
Betanaphthol	lb.	0	3	0	to	0	3	3
Betanaphthylamine, technical	lb.	0	11	6	to	0	12	6
Croceine Acid, 100% basis	lb	0	5	0	to	0	6	3
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	6	9	to	0	7	6
Dinitrobenzol	lb.	0	1	5	to	0	1	6
Dinitrochlorbenzol	lb.	0	1	5	to	0	1	6
Dinitronaphthaline	lb.	0	1	6	to	0	1	8
Dinitrotoluol	lb.	0	1	8	to	0	1	9
Dinitrophenol	lb.	0	3	0	to	0	3	3
Dimethylaniline	lb.	0	5	9	to	0	6	0
Diphenylamine	lb.	0	5	0	to	0	5	3
H-Acid	lb.	0	10	0	to	0	10	6
Metaphenylenediamine	lb.	0	5	9	to	0	6	0
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	7	6	to	0	8	6
Monosulphonic Acid (2:7)	lb.	0	7	6	to	0	8	0
Naphthionic acid, crude	lb.	0	4	0	to	0	4	3
Naphthionate of Soda	lb.	0	4	3	to	0	4	6
Naphthylamin-di-sulphonic-acid	lb.	0	5	0	to	0	5	6
Nitronaphthalene	lb.	0	1	6	to	0	1	8
Nitrotoluol	lb.	0	1	4	to	0	1	5
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	2
Orthotoluidine	lb.	0	2	3	to	0	2	6
Orthonitrotoluol	lb.	0	1	3	to	0	1	4
Para-amidophenol, base	lb.	0	12	6	to	0	13	0
Para-amidophenol, hydrochlor	lb	0	13	0	to	0	13	6
Paradichlorbenzol	lb.	0	0	7	to	0	0	8
Paranitraniline	lb.	0	6	6	to	0	7	0
Paranitrophenol	lb.	0	2	9	to	0	3	0
Paranitrotoluol	lb.	0	5	9	to	0	6	0
Paraphenylenediamine, distilled	lb.	0	13	6	to	0	14	6
Paratoluidine	lb.	0	8	3	to	0	8	6
Phthalic anhydride	lb.	0	4	9	to	0	5	0
Resorcin, technical	lb.	0	7	6	to	0	8	6
Resorcin, pure	lb.	0	9	6	to	0	10	0
Salol	lb.	0	4	0	to	0	4	3
Sulphanilic acid, crude	lb.	0	1	8	to	0	1	9
Tolidine, base	lb.	0	8	6	to	0	10	0
Tolidine, mixture	lb.	0	2	9	to	0	3	0

The following prices are furnished by Messrs. Miles, Mole & Co., Ltd., 101, *Leadenhall Street, London, E.C.*

Metals and Ferro Alloys

	per	£	s.	d.		£	s.	d.
Aluminium, 98-99%	ton	165	0	0	to	165	0	0
Antimony, English	ton	37	0	0	to	42	0	0
Copper, Best Selected	ton	74	0	0	to	75	0	0
Ferro-Chrome, 60%	ton	41	0	0	to	42	0	0
Ferro-Chrome Manganese, loose	ton	28	0	0	to	29	0	0
Silicon, 45-50%	ton	20	0	0	to	21	0	0
Tungsten, 75-80%	lb.	0	2	4	to	0	2	6
Lead Ingot	ton	23	0	0	to	25	0	0
Lead Sheets	ton	38	0	0	to	40	0	0
Nickel, 98-99%	ton	210	0	0	to	210	0	0
Tin	ton	165	0	0	to	167	0	0
Spelter	ton	27	0	0	to	28	0	0

Structural Steel

	per	£	s.	d.		£	s.	d.
Angles and Tees	ton	22	0	0	to	24	0	0
Flats and Rounds	ton	22	0	0	to	25	0	0
Joists	ton	21	0	0	to	23	0	0
Plates	ton	22	0	0	to	23	0	0
Rails, heavy	ton	23	0	0	to	25	0	0
Sheets, 24 Gauge	ton	24	0	0	to	25	0	0
Galvanized Corrd. Sheets	ton	25	0	0	to	27	0	0
Zinc Sheets	ton	39	0	0	to	40	0	0

Cardiff By-Products

Sulphate of Ammonia—	
For home consumption (per ton o.t.)	£24 3s. 6d.
For export (per ton f.o.b.)	£20 to £30
National Benzole (per gallon)	3s. to 3s. 6d.
Solvent Naphtha (per gallon)	2s. 8d. to 2s. 10d.
Heavy Naphtha (per gallon)	3s. 2d. to 3s. 3d.
Crude Naphthalene Salts (per ton)	£9 to £15
Pitch (per ton)	130s. to 140s.
Creosote (per gallon)	1s. to 1s. 1d.
Motor Benzol (per gallon)	3s. 2d. to 3s. 7d.
Crude Benzol (per gallon)	1s. 9d. to 2s.
Toluol (per gallon)	4s.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Companies Winding Up Voluntarily

ANGELIQUE CHEMICAL CO., LTD.—A meeting of creditors will be held at the offices of Messrs. Philip Mordant & Co., 9-10, Fenchurch Street, London, E.C.3., on Friday, February 25, at 2.30 p.m. P. M. Mordant, Liquidator.

INDUSTRIAL GLASS WORKS, LTD.—A meeting of creditors will be held at Regent House, 17, Southampton Street, Fitzroy Square, London, W.1., on February 23, at 3 p.m. Creditors' claims on or before February 23, to the Liquidator, F. W. Adams, at the above address.

METAL INDUSTRIES, LTD., H. Hornyold, 12, Sloane Gate Mansions, Wilbraham Place, London, S.W.1, Liquidator.

ZINC-OXIDE MANUFACTURING CO., LTD., W. Dutton, 20, Acresfield, Bolton, Liquidator.

Mortgages and Charges

*[NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, created after July 1, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.]*

BRITISH COLOUR PRINTING CO. (1920), LTD., London, E.C. Registered February 4, mortgage also charge under Land Transfer Acts, securing all moneys due or to become due, to Barclay's Bank, Ltd.; charged on premises at Briant Street, New Cross.

CALLINGTON OXIDE CO., LTD.—Registered January 25, £1,250 debenture, to J. P. Blight, Callington, solicitor; general charge.

DUNLOP RUBBER CO., LTD., London, N.W.—Registered February 4, charge securing all moneys due or to become due, to London County Westminster & Parr's Bank, Ltd.; charged on a call of 7s. 6d. per share on 3,000,000 £1 shares of the company payable on February 28, 1921. *Nil. March 11, 1920.

MARLEY HILL CHEMICAL CO., LTD., Newcastle-on-Tyne. Registered February 1, £2,000 1st debentures part of £100,000; general charge (except uncalled capital).

SUN FUEL CO., LTD., London, E.C.—Registered February 3, £100,000 debenture, to Cox & Co.; general charge.

WAREHAM CHEMICAL CO., LTD., London, E.C.—Registered January 19, £3,500 mortgage, to National Guardian Investment Co., Ltd., 11, Southampton Buildings, W.C.; charged on Quarry Hill Brick Works, Tonbridge, also general charge (except uncalled capital). *——. May 29, 1920.

Satisfactions

ISLEWORTH RUBBER CO., LTD., London, E.C.—Satisfaction registered February 7, £17,350, registered between February 1, 1917, and October 1, 1917, inclusive.

ACETYLENE & CARBIDE, LTD., Belfast.—Registered February 9, £2,300 debenture, to Bingham Calcium Carbide Co., Ltd.; general charge. *Nil. February 5, 1920.

Bills of Sale

[The undermentioned information is from the Official Registry. It includes Bills of Sale registered under the Act of 1882 and under the Act of 1878. Both kinds require re-registration every five years. Up to the date the information was obtained it was registered as given below; but payment may have been made in some of the cases, although no notice had been entered on the Register.]

BASNETT, W., 20, Bath Parade, Cheltenham, laboratory assistant. Filed. February 9. £32.

THORNE, W. H., 18, Beaconsfield Road, St. Albans, manager of a chemical business. Filed February 8. Deed of gift.

County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

BUTTERWORTH, J.W., 4, Albert Road, Colne, chemist. £20 14s. 4d. January 5.

LEVEY, J. M., 273, Kilburn Lane, N.W., chemist, £17 11s. 2d. January 5.

PLAYFORD, F., 10, Highfield Road, Doncaster, chemist. £16 8s. January 5.

SELLERS, E., Temple Place, Temple Street, Hull, manure merchant. £41 3s. 6d. December 23.

FARRELL, T., Adele, Ynismardy Road, Britonferry, chemical works foreman. £16 13s. 8d. December 8.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIALS.	REF. No.
New York City	Chemicals	240
Paris	Chemical products...	228
Argentina ...	Ferrous and non-ferrous; soaps; aniline dyes	241
Riga ...	Shellac; varnish; gums; mineral rubber	230
Brussels ...	Glassware	200
Boston ...	Glassware	211

Tariff Changes

PALESTINE.—The importation of explosives, saltpetre and salt is prohibited, but blasting explosives may be imported under special licence issued by the Department of Public Works. Cocaine, sulphonal, picrates, and potassium and sodium chlorate may be imported under special licence issued by the Public Health Department.

FRANCE AND ALGERIA.—New coefficients of increase of Customs duties are notified in the *Journal Officiel* for carbide of calcium and for certain kinds of glass.

CHINA.—A surtax at the rate of 10 per cent. of the existing maritime and native Customs duties will be collected in China, as from March 1 next, on imports and exports.

ITALY.—The Customs authorities will continue to have the power to admit laboratory glassware, including graduated measures. It is not necessary for the Italian importer to obtain a Ministerial licence.

SWEDEN.—The prohibitions on the exportation of potassium hydrate; potassium chloride; potassium sulphate; potassium carbonate; salts of gold, platinum and radium; stannous chloride and stannic chloride; and indigo, even if artificial, and other indigo colouring matters, have now been removed.

SWITZERLAND.—The export of the following goods is still subject to individual licence: Saccharin; permanganate of potash; methyl alcohol; aniline, anthracene, and naphthaline colours, and tar colours not specially mentioned in the general tariff; and indigo, natural or artificial.

Company News

ALLEN LIVERSIDGE, LTD.—The report to October 31 last states that during the month the capital was increased from £100,000 to £300,000, and that the company purchased for £93,720, the whole of the shares of the Dissolved Acetylene Co., Ltd., and of Imperial Light, Ltd. Net profit is £35,469, and £43,064 was brought in from previous accounts of the three companies. To reserve against E.P.D., corporation profits tax and income tax, £11,365; balance of amalgamation issues expenses written off, £1,699; to general reserve, £5,850; further dividend at the rate of 15 per cent. per annum, less tax, making 12½ per cent. for the year on shares numbered 1 to 100,000, and dividend at the rate of 12½ per cent. per annum, less tax, for six months to October 31 last on shares numbered 100,001 to 193,720, payable March 3, carrying forward £1,028.

BRITISH BROKEN HILL PROPRIETARY.—Full operations were resumed on November 29 last, but the mine was again closed down on January 20, as an immediate result of the fire at the Port Pirie smelters. Under these conditions the directors state it is incumbent upon them to continue to conserve the financial resources of the company and to make no distribution until the outlook is more assured.

BRITISH CELLULOSE & CHEMICAL MANUFACTURING.—Dividend on the cumulative preference shares due February 1 has been passed.

INTERNATIONAL PAINT & COMPOSITIONS.—Balance dividend of 3 per cent. on ordinary shares, less tax, making 6 per cent. for the year.

LEVER BROTHERS.—It is understood that preliminary negotiations are taking place for an issue of capital which will probably take the form of 7 per cent. debentures. The amount to be offered is understood to be £4,000,000. The present issued capital is £43,172,000.

PREANGER (JAVA) RUBBER.—Interim dividend of 5 per cent. (1s. per share) for 1920-21, making 10 per cent. for the year. The directors state that no further distribution will be made until the rubber market improves.

VENEZUELAN OIL CONCESSIONS.—The accounts to October 31 last show that the sum of £16,825 had been received from premium on shares. Calls and premiums on shares forfeited amount to £197, and sundry creditors in London and Venezuela, £4,786. The cash in hand and in transit was £4,486, while War Loan and Treasury bills at cost stand at £38,937, and sundry debtors at £809. The underwriting commission and commission on issue of new capital is £101,708, and preliminary expenses £1,718. Expenditure in respect of plant, &c., is £106,381, of which £17,857 has been added during the year. General expenditure is shown at £91,917, an increase of £21,621.

New Companies Registered

The following have been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C.2:—

ANGLO-PORTUGUESE CLAY CO., LTD.—To acquire land, mines and mineral properties and develop china-clay, clays and other mines. Nominal capital, £500 in 10,000 shares of 1s. each. Minimum subscription, 7 shares. Directors: W. L. Bamber, H. F. Lyon. Qualification of directors, 100 shares; remuneration of directors, £200 each.

BANN, ARTHUR, LTD., 48, Castle Street, Stockport.—Chemists and druggists. Nominal capital, £5,000 in 5,000 shares of £1 each. Directors: H. Hazeldine, A. Bann. Qualification of directors, £1,000; remuneration of directors, £500 to be divided.

BRAMALL, CHARLES, LTD.—To acquire and carry on the business of silica fire brick manufacturers, &c. Nominal capital, £25,000 in 25,000 shares of £1 each. Directors: M. Bramall (Governing director). Qualification of directors, 100 shares.

FRANKLIN & CO. (BRIGHTON), LTD.—Chemists, &c. Nominal capital, £2,000 in 2,000 shares of £1 each. Directors: A. W. Bellamy, H. W. Chapman, S. Chapman. Qualification of directors, 100 shares.